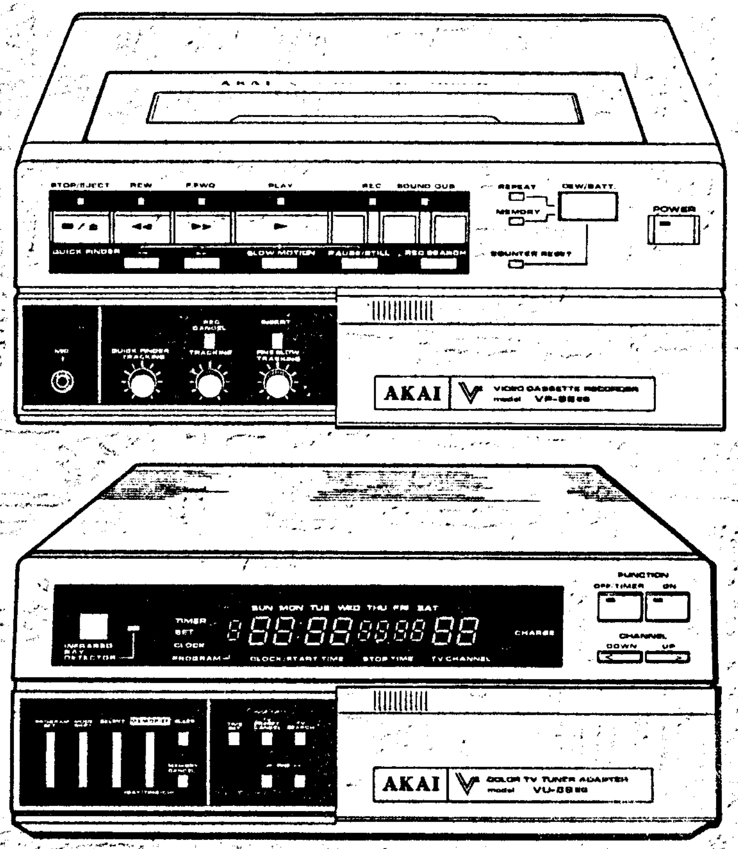
ABBREVIATIONS USED IN VP-88 SERVICE MANUAL

ACC	Automatic Color Control
AE	Audio Erase
AEC	Automatic Edit Control
AFC	Automatic Frequency Control
AGC	Autmoatic Gain Control
AO	Audio Out
A. PB	Audio Playback
APC	Automatic Phase Control
A. REC	Audio Record
BATT	Battery
BPF	Band Pass Filter
B/W	Black and White (Picture)
CAN	Cancel
C and R	Capacitor and Resistor
CE	Chip Enable
CFB	Capstan Feedback
CH	Channel
CHG	Charge
CLK	Clock
CM	Capstan Motor
COV	Converter
CP	Camera Pause
CPW	Capstan Motor Power Supply
CR DIS	Cue Review Suppression Switch (at NTSC Mode)
CSW	Cassette Switch
CTL	Control
DET	Detector
DE-MOD	Demodulator
DFB	Drum Motor Feedback
DL	Delay Line
DOC	Drop Out Compensator (Circuit)
DPW	Drum Motor Power Supply
EAR	Earphone
EE	Electric to Electric (Mode)
EMERG	Emergency
EQ	Equalizer
ES	End Sensor
fH	Frequency corresponding to Horizontal Line Repetition Rate
160fH	160 times fH
fS	Sub-carrier Frequency
"F" Characteristics	Frequency Characteristics
FE	Full Track Erase
FF	Fast Forward
F. F	Flip Flop
FG	Frequency Generator
FINE CUE	Akai Noiseless Cue
F-PL (FPL)	Function Plunger
FSP	Fine Slow Pulse
GND	Ground
1H	1 Horizontal Line
H	High
HPF	High Pass Filter
IL9V	Idling 9V
IRQ	Interrupt Request
KSC	Key Scan
L	Low
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LIM	Limiter
L-M (LM)	Loading Motor
LSW	Loading Switch
L-NG	Lamp Failuer

LPF	Low Pass Filter
MDA	Motor Drive Amplifier
MPX	Multiplex
M-REV	Motor Reverse
MM	Monostable Multivibrator
MOD	Modulator
NT	NTSC (Mode)
O. MUTE	Output Mute
OSC	Oscillator (Oscillation)
PB	Playback
PC	Phase Compensator
PD	Phase Detector
P-INSERT	Picture Insert
PLG	Plunger
PSW	Power Switch
QU-V	Quasi (Pseudo) V Sync
RAM	Random Access Memory
REC	Record
REMO-CON	Remote Control
REW	Rewind
RFB	Reel Motor Feedback
RH	Reel Motor Voltage High
RL	Reel Motor Voltage Low
RL	Relay
R MUTE	Record Mute
R/P	Record Playback
RP	Reel Pulse
RPW	Reel Motor Power Supply.
RST	Reset
RSW	Record Suppression Switch
SC	Serial Clock
SD (S DUB)	Sound Dub
SEPA	Separator
S & H	Sample and Hold
SI	Data to be transferred from VU
SIN	Data to be transferred from SYSTEM micro computer
S-INSERT	Sound Insert
S/N	Signal to Noise Ratio
SR	Silicon Rectifier
SRP	Supply Reel Pulse
SS	Start Sensor
STBY	Stand By
SW	Switch(ing)
SWP	Switching Pulse
SW. REG	Switching Regulator
SYS. CON	System Control
TC	Timer Counter
TC	Timer Clock
TMS	IC TMS 1100
TR	Transistor
TRP	Take-up Reel Pulse
VC	Variable Capacitor
VCO	Voltage Controlled Oscillator
VI	Video Input
V-LINE	Video Line
VO	Video Out
VR	Variable Resistor
V-SYNC	Vertical Sync
VU	Voltage for UHF Band
VXO	Voltage Controlled Crystal Oscillator
W/D	White and Dark
Y	Luminance

VP-88
VA-88
VU-88

AKAI SERVICE MANUAL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STOP/EJECT
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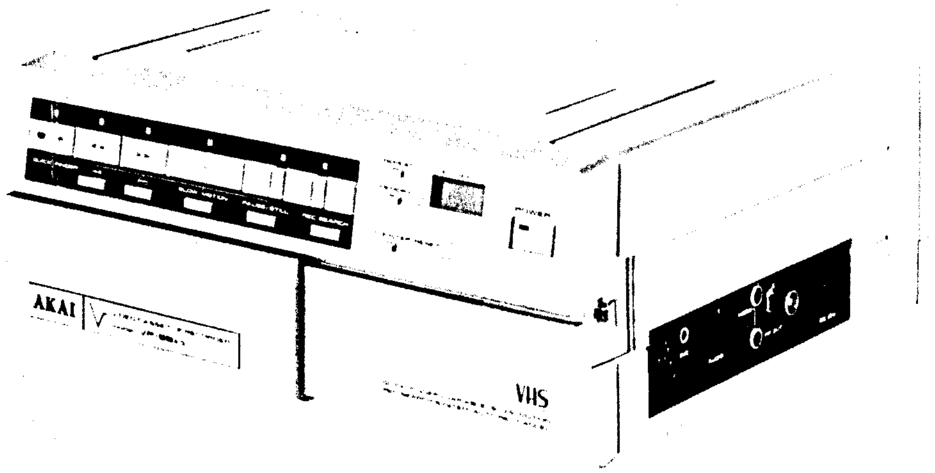
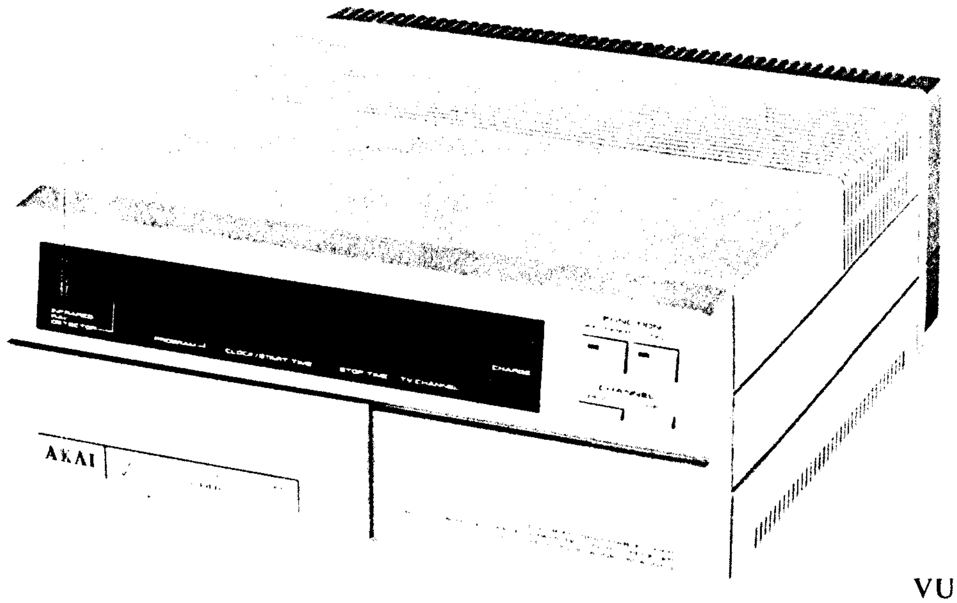
F.FWD
PLAY
REC
SOUND DUB
REPEAT
MEMORY
CEW/BATT.
POWER
QUICK FINDER
SLOW MOTION
PAUSE/STILL
REC SEARCH
COUNTER RESET
REC CANCEL
INSERT
QUICK FINDER TRACKING
TRACKING
FINE SLOW TRACKING
AKAI
VIDEO CASSETTE RECORDER
SUN MON TUE WED THU FRI SAT
TIMER
SET
CLOCK
PROGRAM
CLOCK/START TIME
STOP TIME
TV CHANNEL
CHARGE
INFRARED RAY DETECTOR
FUNCTION
OFF-TIMER
ON
CHANNEL
DOWN
UP
AKAI
COLOR TV TUNER ADAPTER

VIDEO CASSETTE RECORDER
MODEL VP-88EG/EK/EA/EGN
AC POWER ADAPTER
MODEL VA-88EG/EK
COLOR TV TUNER ADAPTER
MODEL VU-88EG/EK/EA/EO



VP-88EG



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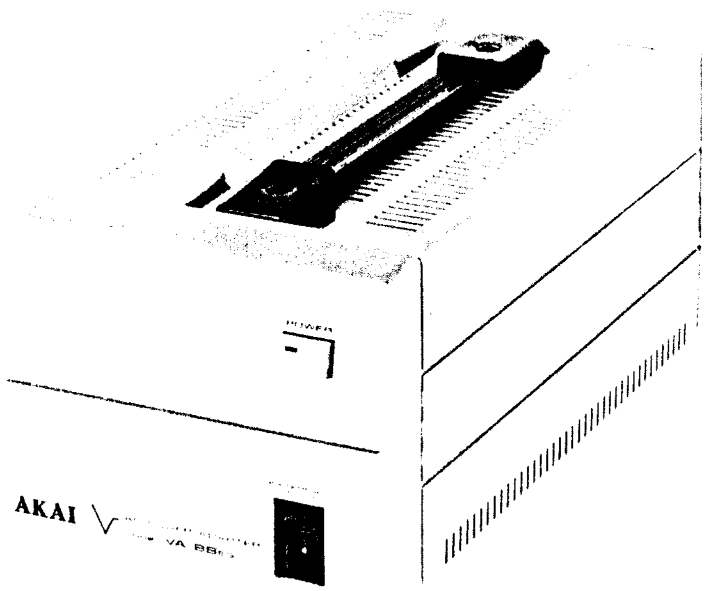
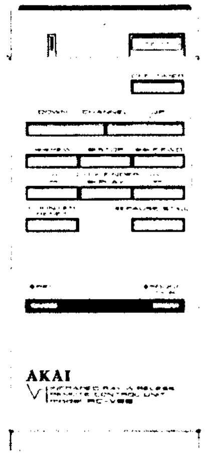


VA-88EG



RC-V88

VIDEO CASSETTE RECORDER

MODEL VP-88EG/EK/EA/EGN

AC POWER ADAPTER

MODEL VA-88EG/EK

COLOR TV·TUNER ADAPTER

MODEL VU-88EG/EK/EA/EO

INFRARED RAY WIRELESS REMOTE CONTROL UNIT

MODEL RC-V88

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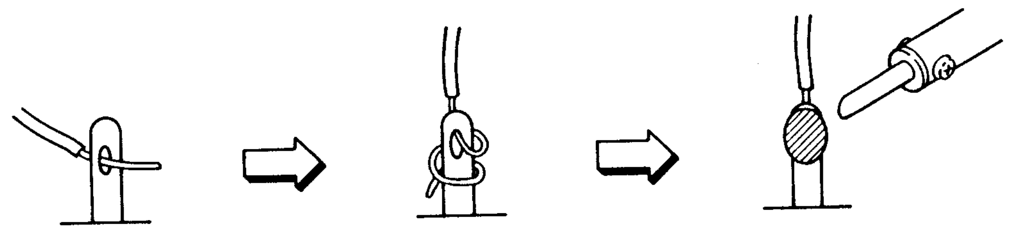
SAFETY INSTRUCTIONS

SAFETY CHECK AFTER SERVICING

Confirm the specified insulation resistance between power cord plug prongs and externally exposed parts of the set is greater than 10 Mohms, but for equipment with external antenna terminals (tuner, receiver, etc.) and is intended for $\boxed{\text{C}}$ or $\boxed{\text{A}}$, specified insulation resistance should be more than 2.2 Mohms (ground terminals, microphone jacks, headphone jacks. line-in-out jacks etc.)

PRECAUTIONS DURING SERVICING

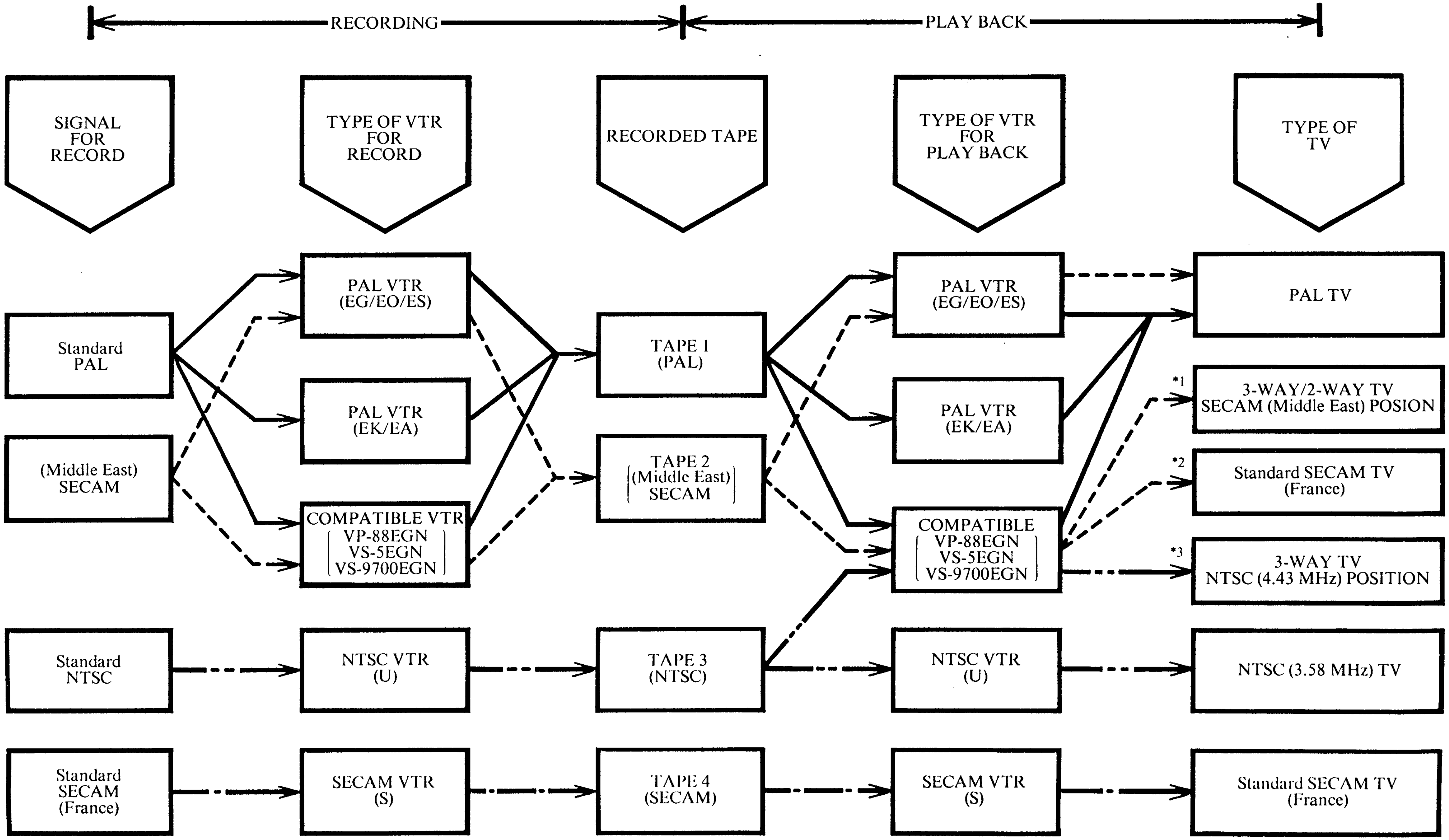
1. Parts identified by the ⚠ symbol parts are critical for safety.
   Replace only with parts number specified.
2. In addition to safety, other parts and assemblies are specified for conformance with such regulations as those applying to spurious radiation. These must also be replaced only with specified replacements.
   Examples: RF converters, tuner units, antenna selector switches, RF cables, noise blocking capacitors, noise blocking filters, etc.
3. Use specified internal wiring. Note especially:
   1) Wires covered with PVC tubing
   2) Double insulated wires
   3) High voltage leads
4. Use specified insulating materials for hazardous live parts. Note especially:
   1) Insulation Tape
   2) PVC tubing
   3) Spacers (Insulating Barriers)
   4) Insulation sheets for transistors
5. When replacing AC primary side components (transformers, power cords, noise blocking capacitors, etc.), wrap ends of wires securely about the terminals before soldering.



6. Observe that wires do not contact heat producing parts (heatsinks, oxide metal film resistors, fusible resistors, etc.).
7. Check that replaced wires do not contact sharp edged or pointed parts.
8. Also check areas surrounding repaired locations.
9. Use care that foreign objects (screws, solder droplets, etc.) do not remain inside the set.

PRECAUTIONS

With VTRs, there are different systems for different areas.
Consequently tape inter-changecability and monitor TV selection are very important so please study and refer to chart when explaining to customers or repairing.

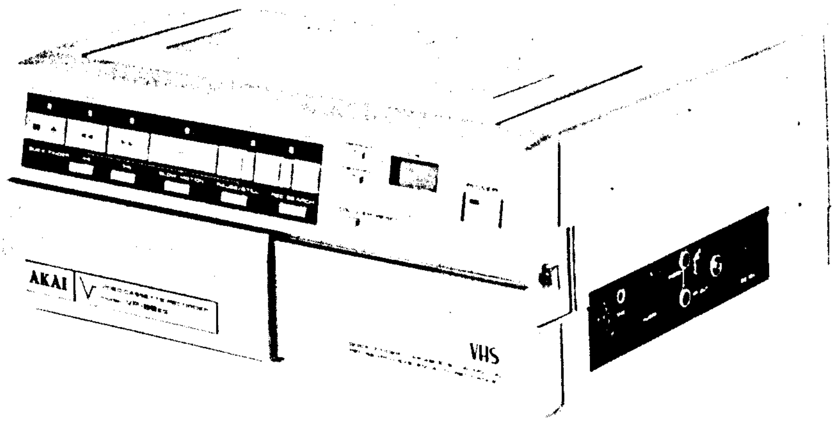

RECORDING
PLAY BACK
SIGNAL FOR RECORD
TYPE OF VTR FOR RECORD
RECORDED TAPE
TYPE OF VTR FOR PLAY BACK
TYPE OF TV
Standard PAL
(Middle East) SECAM
Standard NTSC
Standard SECAM (France)
PAL VTR (EG/EO/ES)
PAL VTR (EK/EA)
COMPATIBLE VTR (VP-88EGN VS-5EGN VS-9700EGN)
NTSC VTR (U)
SECAM VTR (S)
TAPE 1 (PAL)
TAPE 2 (Middle East) SECAM
TAPE 3 (NTSC)
TAPE 4 (SECAM)
PAL VTR (EG/EO/ES)
PAL VTR (EK/EA)
COMPATIBLE (VP-88EGN VS-5EGN VS-9700EGN)
NTSC VTR (U)
SECAM VTR (S)
PAL TV
*1
3-WAY/2-WAY TV SECAM (Middle East) POSION
*2
Standard SECAM TV (France)
*3
3-WAY TV NTSC (4.43 MHz) POSITION
NTSC (3.58 MHz) TV
Standard SECAM TV (France)

Notes:

*1 For picture reproducing, switch to the SECAM position either of 3-way TV (PAL/SECAM (Middle East)/NTSC (4.43 MHz) or 2-way TV (PAL/SECAM (Middle East)).

*2 Through only Line input (Not RF).

*3 Reproduction is possible at NTSC 4.43 MHz position of 3-way TV.



SECTION 1

SERVICE MANUAL

Video Cassette Recorder
Model VP-88EG/EK/EA/EGN

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I. SPECIFICATIONS

Format	VHF Standard
Video Recording System	Rotary, slant azimath, two-head helical scan system
Tape Width	12.65 mm
Tape Speed (Normal)	PAL/SECAM : 23.39 mm/sec. NTSC : 33.35 mm/sec (EGN only)
Quick Finder	Approx. 9 times normal speed (Only with VA-88 or VU-88) (Not on NTSC mode)
Slow-motion Speed	1/4, 1/5, 1/7, 1/10, 1/19 normal speed, variable
Recording or Play Back Time	240 min. with E-240 cassette (PAL/SECAM) 168 min. with E-240 cassette (NTSC) (EGN only) 160 min. with T-240 cassette (NTSC) (EGN only)
Fast Forward and Rewind Time	4 min. with E-240 cassette
Recording	PAL/SECAM 625 lines/50 Hz
Play Back	PAL/SECAM 625 lines/50 Hz NTSC 525 lines/60 Hz
Video Signal	
Line Input Level	0.5 to 2.0 Vp-p/75 ohms unbalanced
Line Output Level	1.0 Vp-p/75 ohms unbalanced
Signal to Noise Ratio	More than 43 dB
Horizontal Rosolution	More than 250 lines (PAL) More than 220 lines (SECAM)
Audio Signal	
Line Input Level	–20 dBs/10 kohms unbalanced
Mic Input Level	–70 dBs/2.7 kohms unbalanced
Line Output Level	–6 dBs/1 kohms unbalanced
Signal to Noise Ratio	More than 40 dB
Frequency Response	70 Hz to 8 kHz
Aerial Output	System B type Modulation (System I type for EK model)
VP-88EG/EK/EGN	UHF channels 30 to 39 (adjustable) Set to channel 36 prior to shipment.
VP-88EA	VHF channel 3 or 4 (switchable) Set to channel 4 prior to shipment.
Power Requirement	12V DC
Power Consumption	8 watts (max)
Temperature	
Operating	5°C to 40°C
Storage	–20°C to 60°C
Dimentions	277 (W) × 115 (H) × 262.5 (D) mm (10.9" × 4.5" × 10.3")
Weight	
VP-88EG/EK/EA	5.25 kg (11.5 lbs) including battery pack 4.65 kg (10.2 lbs) without battery pack
VP-88EGN	5.42 kg (11.9 lbs) including battery pack 4.82 kg (10.6 lbs) without battery pack

* For improvement purposes, specifications and design are subject to change without notice.

II. DISMANTLING OF UNIT

In case of trouble, etc. necessitating dismantling, please dismantle in the order shown in the photographs. Reassemble in reverse order.

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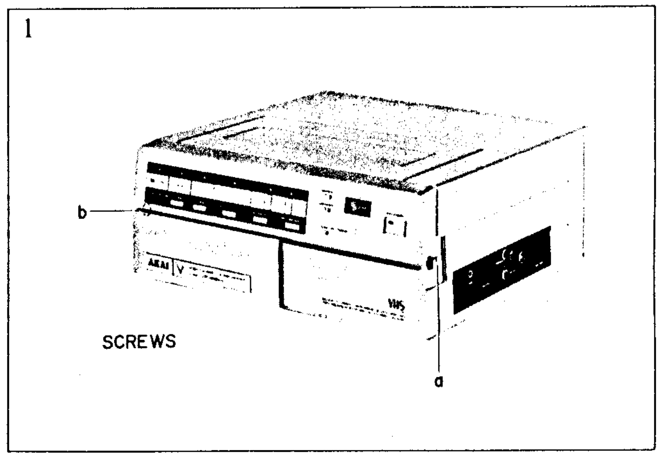

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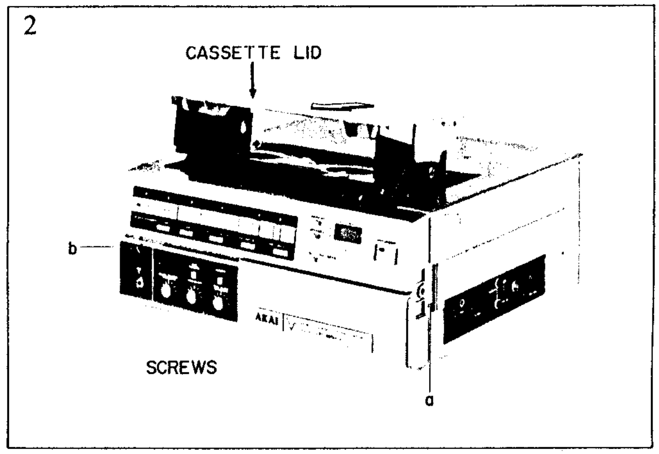

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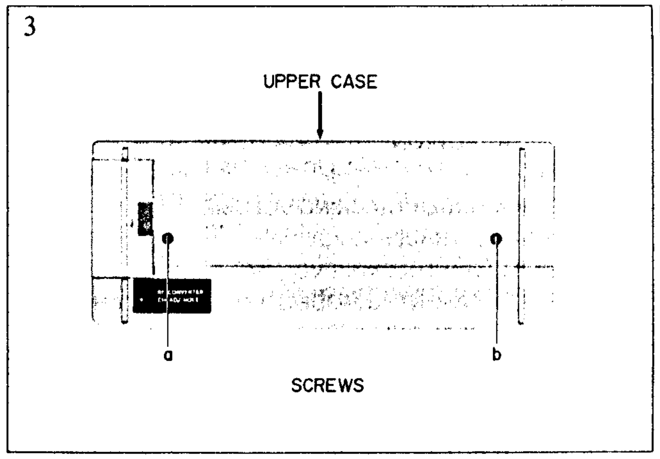

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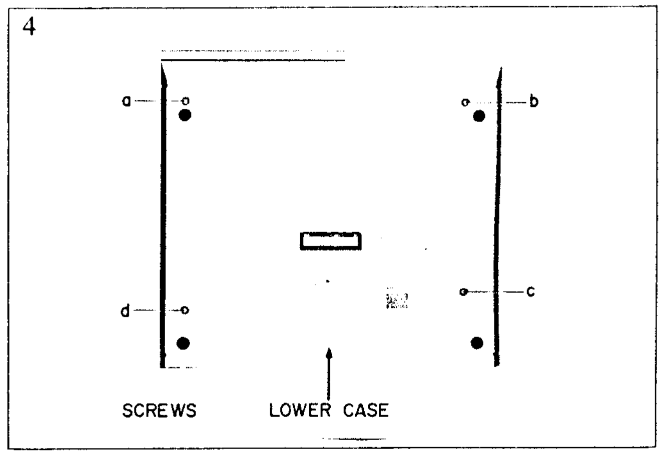

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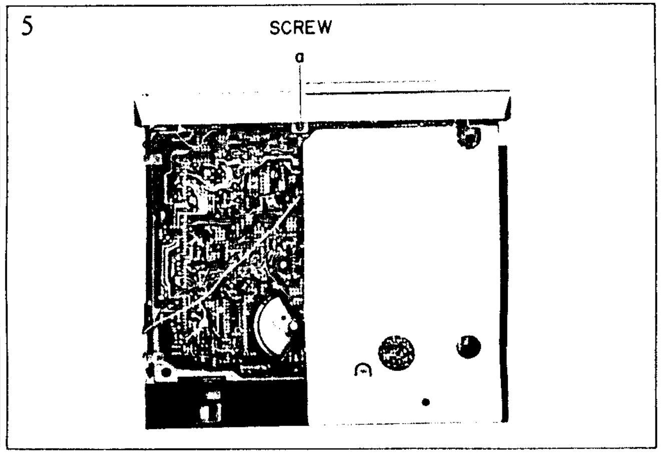

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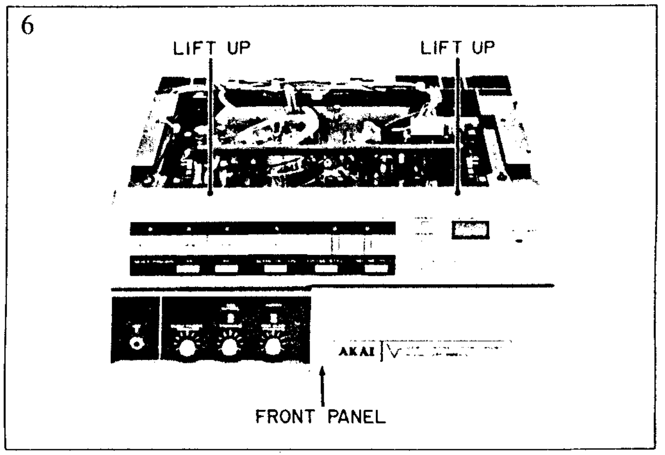

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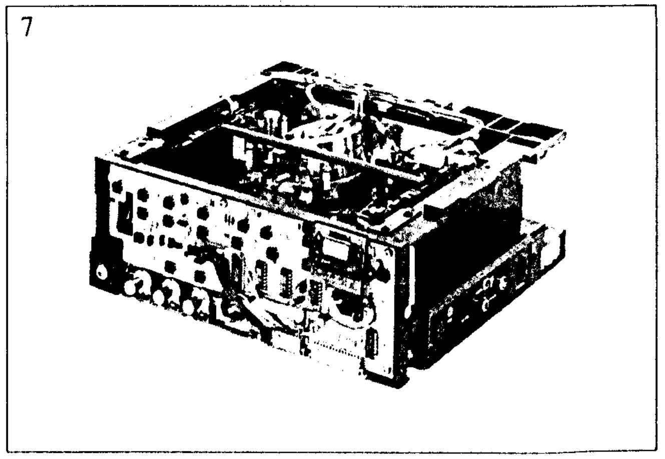
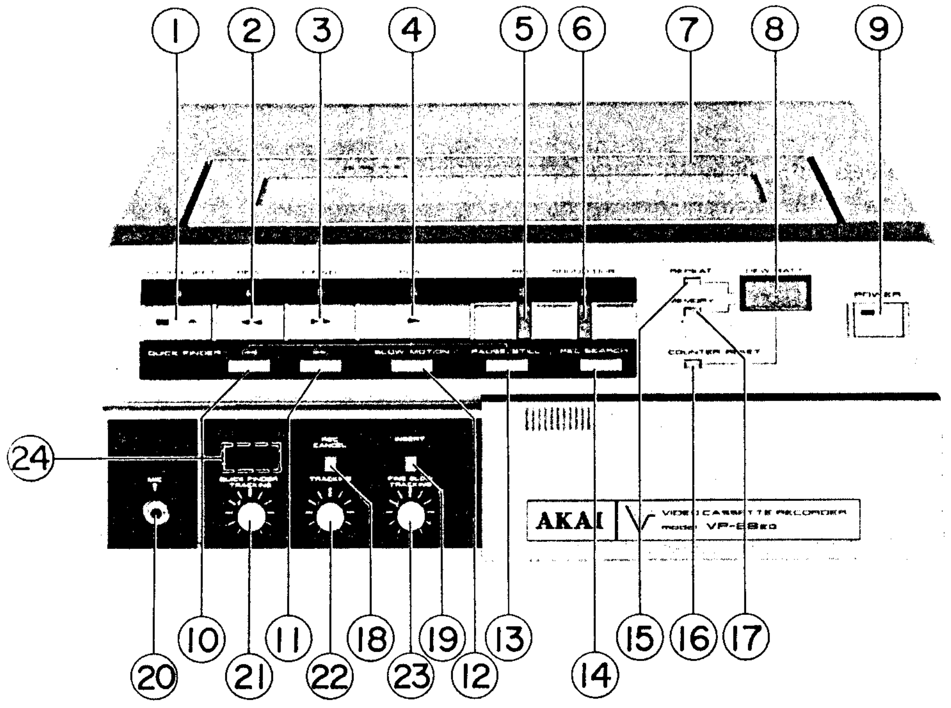


III. CONTROLS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AKAI
VIDEO CASSETTE RECORDER
VP-88
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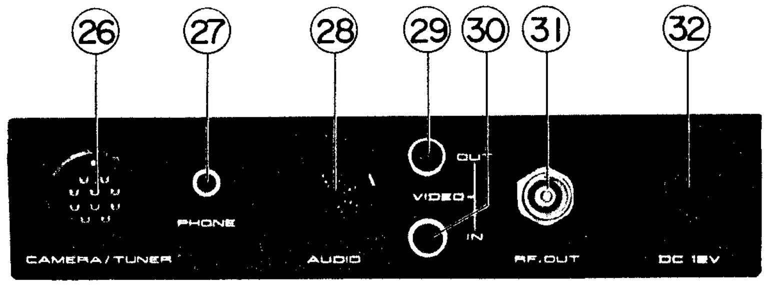
Fig. 3-1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CAMERA/TUNER
PHONE
AUDIO
OUT
VIDEO
IN
RF.OUT
DC 12V

Fig. 3-2

1. STOP/EJECT BUTTON
2. REWIND BUTTON
3. FAST FORWARD BUTTON
4. PLAY BUTTON
5. RECORDING (REC) BUTTON
6. SOUND DUB BUTTON
7. CASSETTE HOLDER
8. LCD INDICATOR
   (DEW, BATTERY, COUNTER, REPEAT and MEMORY)
9. POWER SWITCH BUTTON
10. QUICK FINDER (◀◀, REVIEW BUTTON)
11. QUICK FINDER (▶▶, QUE BUTTON)
12. SLOW MOTION BUTTON
13. PAUSE/STILL BUTTON
14. REC SEARCH BUTTON
15. REPEAT BUTTON
16. COUNTER RESET BUTTON
17. MEMORY BUTTON
18. REC CANCEL BUTTON
19. INSERT BUTTON
20. MIC JACK
21. QUICK FINDER TRACKING VOLUME
22. NORMAL TRACKING VOLUME
23. FINE SLOW TRACKING VOLUME
24. PAL/SECAM/NTSC MODE SELECTOR SWITCH
   (EGN MODEL ONLY)
26. CAMERA/TUNER CONNECTOR JACK
27. PHONE JACK
28. AUDIO IN/OUT CONNECTOR JACK (LINE)
29. VIDEO OUT JACK (LINE)
30. VIDEO IN JACK (LINE)
31. DC POWER SOURCE JACK

IV. PRINCIPAL PARTS LOCATION

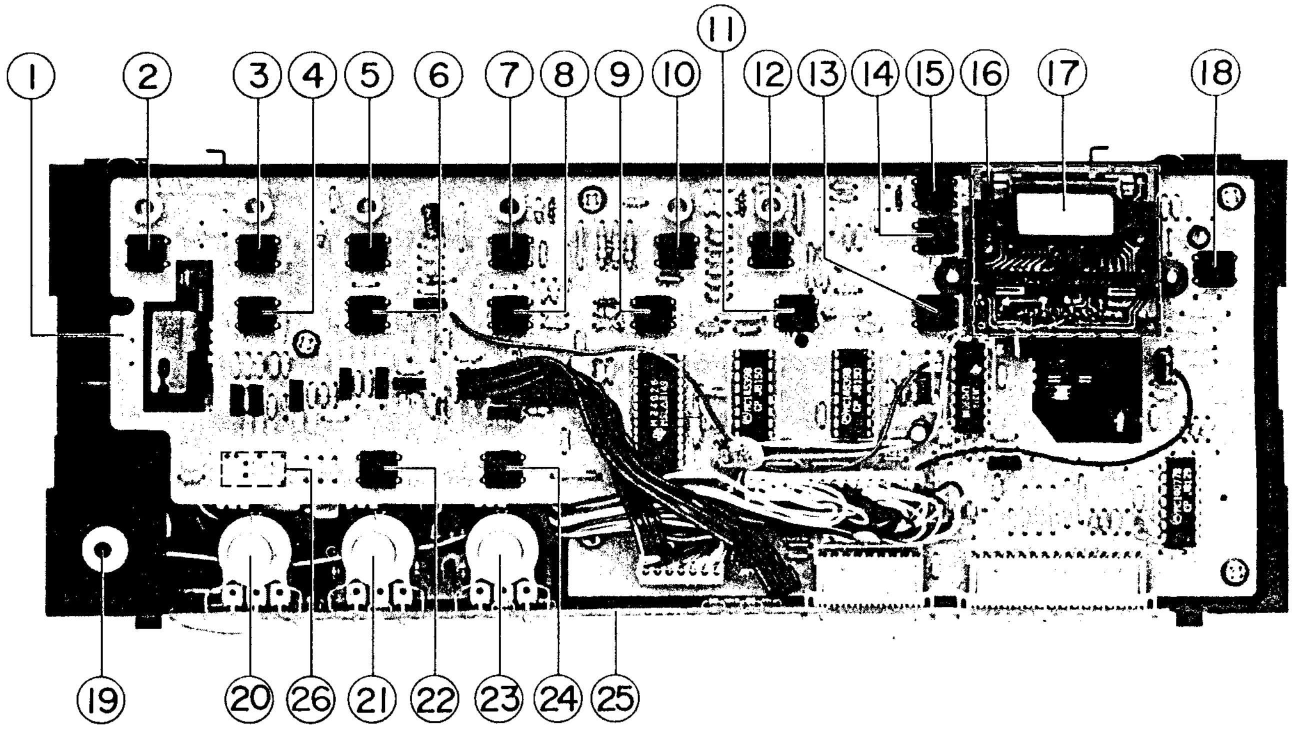
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Fig. 4-1

1. DISPLAY P.C BOARD (V2004A501B)
2. STOP/EJECT SWITCH (SW1)
3. REWIND SWITCH (SW2)
4. QUICK FINDER (◀◀, REVIEW) SWITCH (SW7)
5. FAST FORWARD SWITCH (SW3)
6. QUICK FINDER (▶▶, QUE) SWITCH (SW 8)
7. PLAY SWITCH (SW4)
8. SLOW MOTION SWITCH (SW9)
9. PAUSE/STILL SWITCH (SW10)
10. RECORDING SWITCH (SW5)
11. REC SEARCH SWITCH (SW11)
12. SOUND DUB SWITCH (SW6)
13. COUNTER RESET SWITCH (SW16)
14. MEMORY SWITCH (SW15)
15. REPEAT SWITCH (SW14)
16. LCD P.C BOARD
17. LCD DISPLAY
18. POWER SWITCH (SW17)
19. MIC JACK
20. QUICK FINDER TRACKING VOLUME (VR25)
21. TRACKING (NORMAL PLAY) VOLUME (VR23)
22. REC CANCEL SWITCH (SW12)
23. FINE SLOW TRACKING VOLUME (VR24)
24. INSERT SWITCH (SW13)
25. SERVO & SYSCON PC BOARD (V2004A501A)
26. PAL/SECAM/NTSC SELECTOR SWITCH
   (SW18, EGN MODEL ONLY)

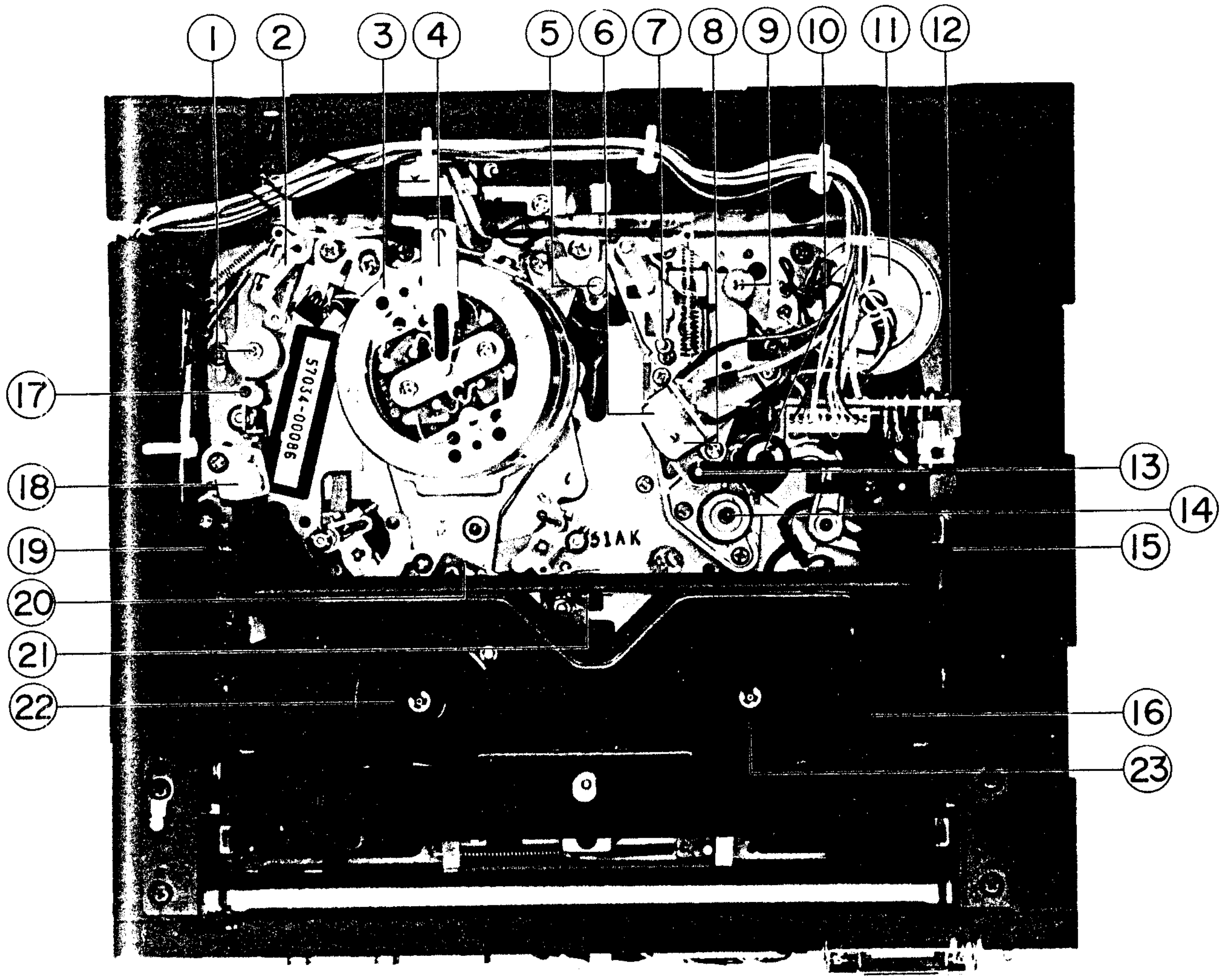
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Fig. 4-2

1. S. IMPEDANCE ROLLER
2. ARM QUE L
3. HEAD DRUM BLOCK
4. EARTH HOLDER
5. SCREW ADJUST CUE
6. AUDIO ERASE HEAD
7. ARM QUE R
8. AUDIO/CONTROL HEAD
9. SCREW, ADJUST TRACKING
10. PINCH ROLLER
11. CAPSTAN MOTOR
12. CAPSTAN MOTOR DRIVE P.C BOARD
13. TAKE-UP GUIDE POLE
14. CAPSTAN
15. TAPE END SENSOR (TAKE-UP)
16. CASSETTE HOLDER
17. SUPPLY GUIDE POLE
18. FULL ERASE HEAD
19. TAPE END SENSOR (SUPPLY)
20. DEW SENSOR
21. CASSETTE LAMP
22. SUPPLY REEL TABLE
23. TAKE-UP REEL TABLE

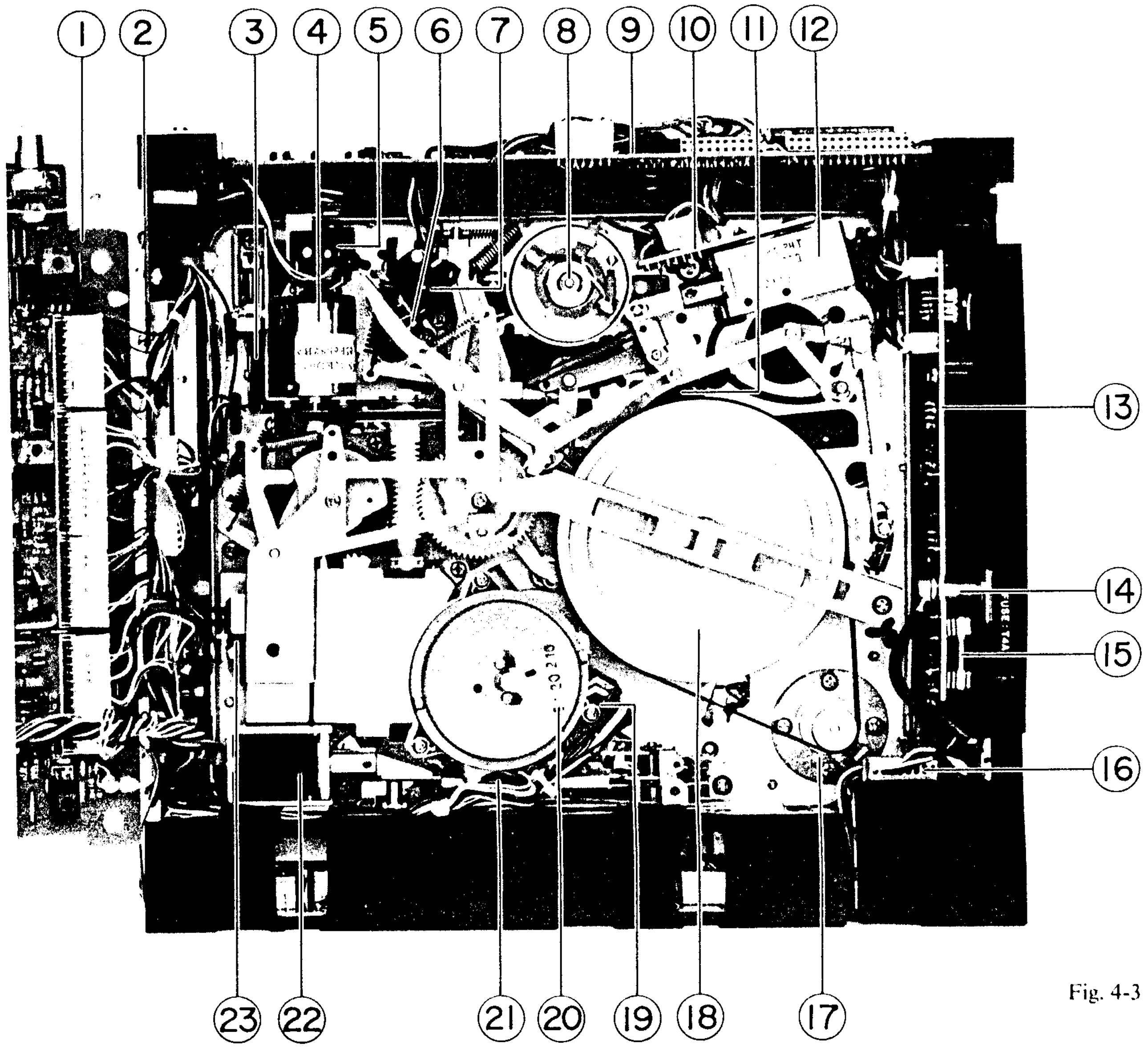
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Fig. 4-3

1. SERVO & SYSCON P.C BOARD
2. POWER & AUDIO P.C BOARD
3. EJECT SWITCH (SW901)
4. LOADING MOTOR
5. REC SAFETY SWITCH (SW902)
6. SUPPLY REEL PULSE P.C BOARD
7. LOADING SWITCH B (SW904)
8. REEL MOTOR
9. DISPLAY P.C BOARD
10. PLG P.C BOARD
11. TAKE-UP REEL PULSE P.C BOARD
12. FAST PLUNGER (SL902)
13. JACK P.C BOARD
14. RF OUT CONNECTOR
15. FUSE F1
16. RF CONVERTER
17. REEL MOTOR
18. CAPSTAN FLYWHEEL
19. DRUM MOTOR BLOCK
20. DRUM FLYWHEEL
21. DRUM PICK-UP HEAD
22. CUE PLUNGER (SL901)
23. LOADING SWITCH A (SW903)

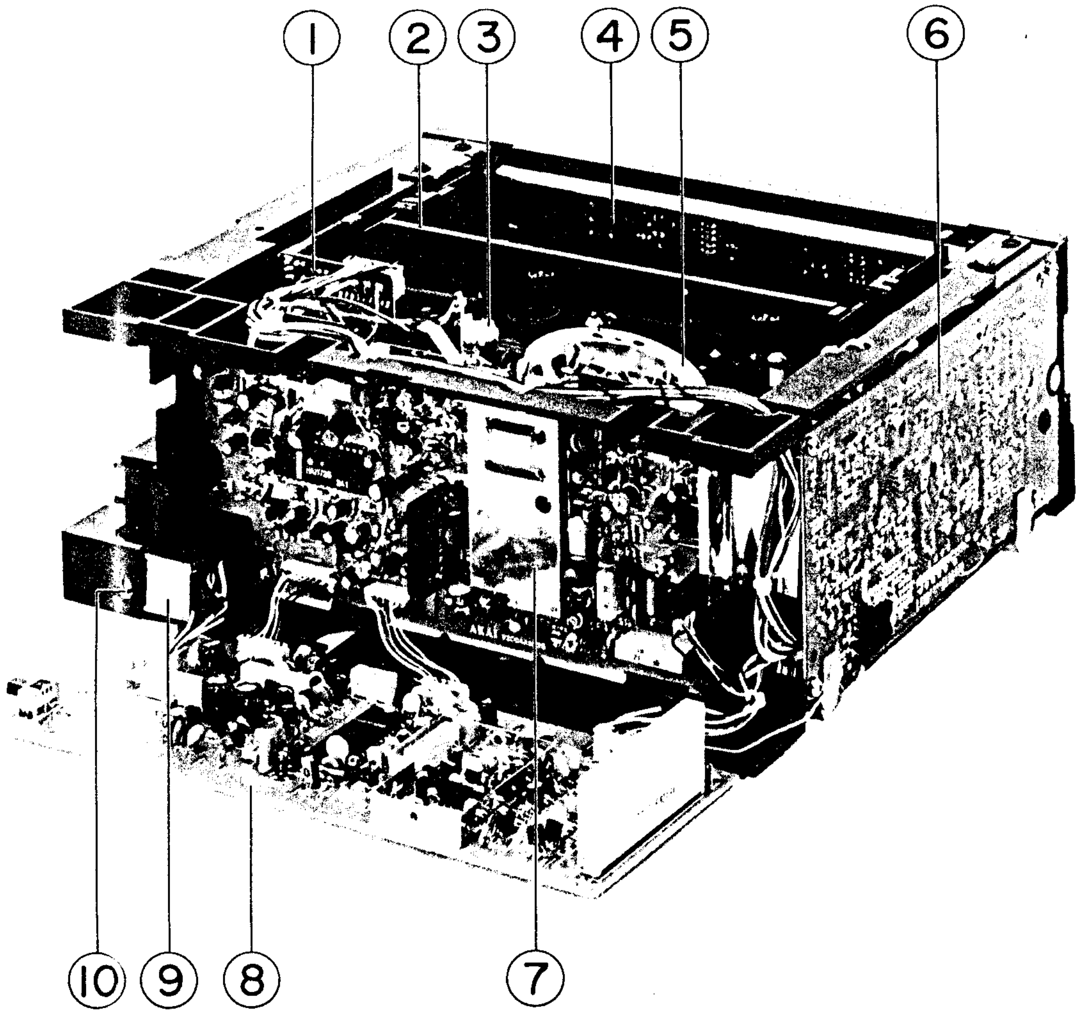


Fig. 4-4

1. CAPSTAN MOTOR DRIVE P.C BOARD
2. CASSETTE HOLDER
3. AUDIO/CONTROL HEAD
4. DISPLAY P.C BOARD
5. HEAD DRUM BLOCK (UPPER DRUM)
6. POWER & AUDIO P.C BOARD
7. VIDEO Y P.C BOARD
8. VIDEO CHROMA P.C BOARD
9. RF CONVERTER
10. CHANNEL ADJUSTMENT SCREW

V. CIRCUIT DESCRIPTION

1. MAIN FEATURES OF VP-88

1-1. FINE CUE

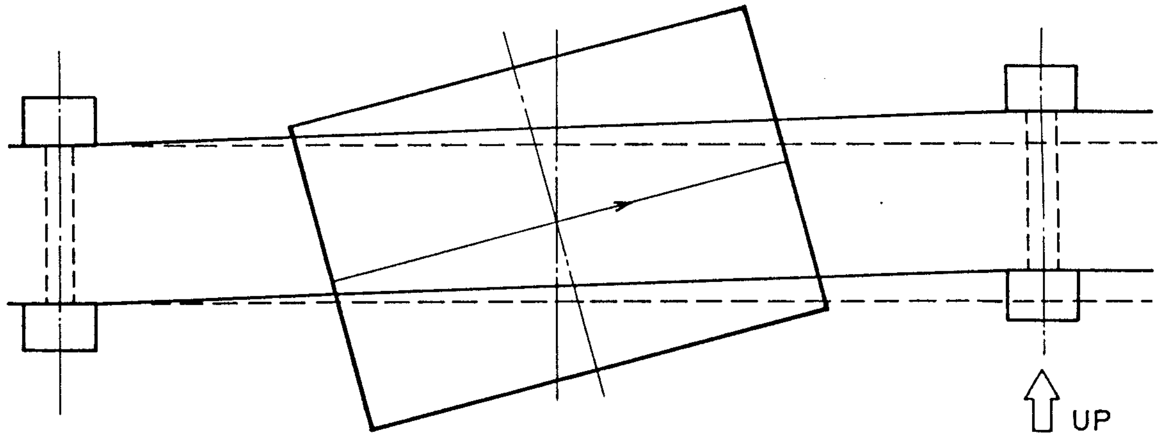


Fig. 5-1 Principale of FINE CUE

With conventional CUE, the noise bar appears on the screen. However, on VP-88, noise-free FINE CUE is employed. The FINE CUE is implemented by slanting the video tape as illustrated in Fig. 5-1 so as to allow the recording pattern on the tape to coincide with the path traced by the video head.

1-2. FINE SLOW

Noise-less slow-motion playback is made possible by running the tape in such a manner that the path traced by the video head does not cross the "inhibit" line. (See Fig. 5-5)

1-3. LIGHT-WEIGHT

Use of a plastic chassis and light-weight motor, etc. has resulted in reduction in weight (4.65 kg without battery).

1-4. RECORD SEARCH FUNCTION

This function searches for the end of a paticular section of recording on the tape. When the end is found, the VP-88 is put into RECORD PAUSE mode.

1-5. RECORD CANCEL FUNCTION

1) If the REC CANCEL button is pressed within 5.2 seconds (or 130 CTL pulses) after pressing the REC button, the tape is rewound at three times the normal tape speed to the point where the REC button was pressed, and then the VP-88 is put into RECORD PAUSE mode.
2) If the REC CANCEL button is pressed with a lapse of more than 5.2 seconds after pressing the REC button, REVIEW action takes place at three times the normal speed, thereby making it possible to select the proper point to recommence shooting.

1-6. PAUSE REWIND FUNCTION

If the PAUSE/STILL button is pressed during recording, tape rewind takes place at three times the normal speed for a period equivalent to 60 CTL pulses or 2.4 secs, and then the VP-88 is put into RECORD PAUSE mode.

1-7. REPEAT FUNCTION

Pressing the REPEAT button during PLAY will cause the VP-88 to repeat playback from tape start or moving controlled zero counter reading.

1-8. INSERT FUNCTION

This function permits both VIDEO and AUDIO to be inserted in an uninterrupted fashion.
1) Insertion of the picture only.
2) Insertion of both the picture and sound.
This function ensures continuity with recordings before and after the insertion.

1-9. AUTO-REWIND FUNCTION

This function causes the rewind operation to take place when the end of the tape is detected during PLAY or CUE modes.

1-10. POWER SAVING

(POWER CONSUMPTION: 8 watts at PB)

1) A highly-efficient switching regulator employed on VP-88 provides four different outputs that match different circuit voltage requirements, permitting reel motor, capstan motor or drum motor voltage to be minimized in each mode through microcomputer-based control.
2) A CMOS type LSI is employed as the main System microcomputer.
3) The REC SEARCH function implemented on VP-88 permits the precise end of the recording to be determined automatically even if the power is turned off between recordings.
4) The sensor lamp is designed to blink during the REC mode, thereby reducing its power consumption to one-tenth or less.
5) The action of the plunger is interlocked with the motion of the loading motor, thereby reducing the power consumption by the plunger at start-up time.

2. THE MECHANISM SYSTEM

2-1. FINE CUE DESCRIPTION

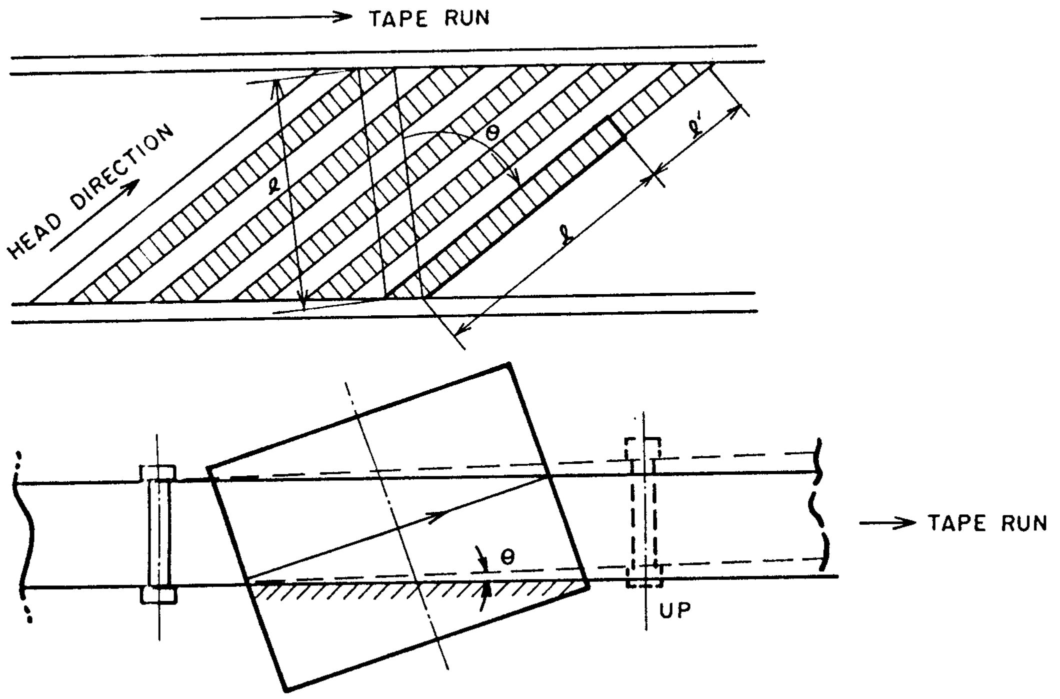


Fig. 5-2. Principle of FINE CUE

The recorded tracks can be traced properly if the tape is slanted by " θ " by raising one end of the tape during CUE time as shown in Fig. 5-2. During this time, if the tape runs at the normal speed multiplied by an odd number, then CH-2 also traces the proper track. This is the principle of the "noiseless CUE" developed by AKAI.

As illustrated in Fig. 5-2, the track length ($\ell + \ell'$) at normal speed recording is not equal to the length "ℓ" at cue-playback time. Therefore, the drum rotation speed must be changed to allow the proper time needed for 1H. Further, since the "ℓ'" portion of the track is not played back, it is not reproduced on the screen. This, however, poses no problem since the "ℓ'" portion accounts for only about 25H (PAL method).

2-2. FINE SLOW DESCRIPTION

With a helical-scan VTR, the recording can be played back in slow motion by running the tape at a speed slower than the recording speed. However, this difference in tape speed causes a difference in the inclination of the paths, traced by the video heads, resulting in noise being generated as the boundary between tracks is crossed.

To overcome this, the fine slow-motion feature is incorporated which permits noise-less slow-motion playback based on the advantage of the azimuth 2-head recording system.

In Fig. 5-5, the straight line "A" represents the playback path taken at normal tape speed. The line passes along tracks 1, 2, 3, 4, ... and so on between the "inhibit" lines.

The video heads are attached to the rotating drum with their heights different for CH-1 and CH-2 but their bottoms located at the same height.

However, since each track overwrites any overlap from the previous track, the track width is kept at a constant value determined by the track pitch, resulting in normal patterns being produced.

The playback path becomes wider on CH-2 by Δh (or the difference in relative head height Fig. 5-6). As a result, the still picture is produced through repetition (e.g., tracks 7, 8, 7, 8, ...) as shown by "B" in Fig. 5-5, thereby making it possible to skip the inhibit line.

Fig. 5-3 is the block diagram for playback in slow motion:

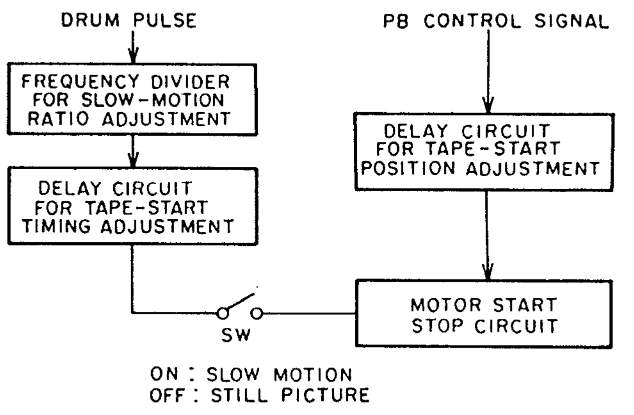

DRUM PULSE
PB CONTROL SIGNAL
FREQUENCY DIVIDER FOR SLOW-MOTION RATIO ADJUSTMENT
DELAY CIRCUIT FOR TAPE-START POSITION ADJUSTMENT
DELAY CIRCUIT FOR TAPE-START TIMING ADJUSTMENT
MOTOR START STOP CIRCUIT
SW
ON : SLOW MOTION
OFF : STILL PICTURE

Fig. 5-3. Control System Block Diagram

1) The still picture is reproduced in noise-less fashion as described above.
2) Tape running is started by the pulse generated by delaying the drum pulse and which is in synchronization with the head rotation.
3) During the elapse of time for 2 frames, the tape is advanced by the length equivalent to the pitch of 2 adjacent tracks. (From point "a" through point "c")
4) The tape is stopped by the pulse generated by delaying the PB control signal prior to initiation of the noise-less still picture reproduction.
5) Repeat the above steps 1 through 4 .

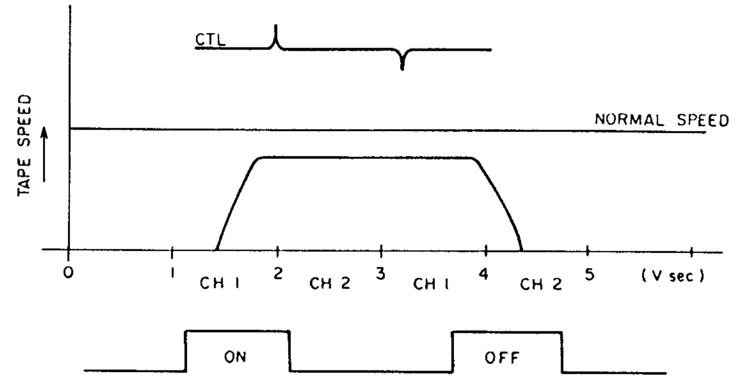


Fig. 5-4

The delay time of the drum pulse that determines the tape-start timing and the delay time of the control signal that determines the tape-stop position must be adjusted during actual operation, so that no noise will be generated.

The tape is moved in accordance with the DC voltage applied to the DC motor. Its speed increases gradually until the standard speed is reached. The tape is stopped by shorting the counter-electromotive force. The average tape speed is about half the normal speed.

In this manner, the tape can be run without allowing the path trace by the head to cross the inhibit line, thereby making it possible to effect noise-less slow-motion playback. Further, by repeating the steps 2 , 3 and 4 , it is possible theoretically to effect slow motion playback at speeds ranging from 1/2 to 1/∞ of the standard speed.

By frequency-dividing the drum pulse by "N" to generate the tape drive pulse, it is possible to reproduce (N − 2) frames continuously as noise-less still pictures 1) and obtain a slow-motion ratio of 1/N.

* The inhibit line refers to the tracking path that is associated with the condition where playback output becomes zero when tracking is shifted one track-pitch during the time of still-picture reproduction with the unbalance head.

3-1-1. Operating Principle of the Switching Regulator (SW. REG)

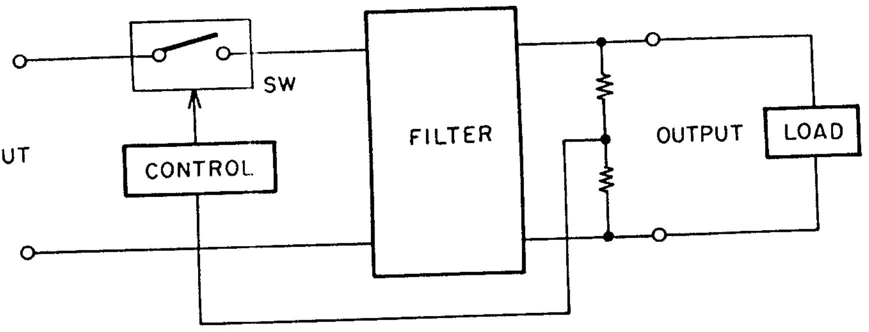

SW
INPUT
CONTROL
FILTER
OUTPUT
LOAD

Fig. 5-9 SW. REF. Block Diagram

With SW. REG, the time interval for transferring the DC input to the output is varied intermittently by means of a switching transistor; and the output is stabilized by controlling the ON time. However with a series regulator, output is stabililzed through power consumption (power transistor). Only the transfer loss (transistor switching loss, VCE (sat), filter's DC resistance, etc.) is involved

With batteries in use, the series regulator loss increases as the input voltage becomes higher. However, with SW. REG, the transfer loss will remain almost constant as long as the output current remains constant. This is the major advantage of SW. REG over a series regulator.

3-1-2. 9V Power Supply

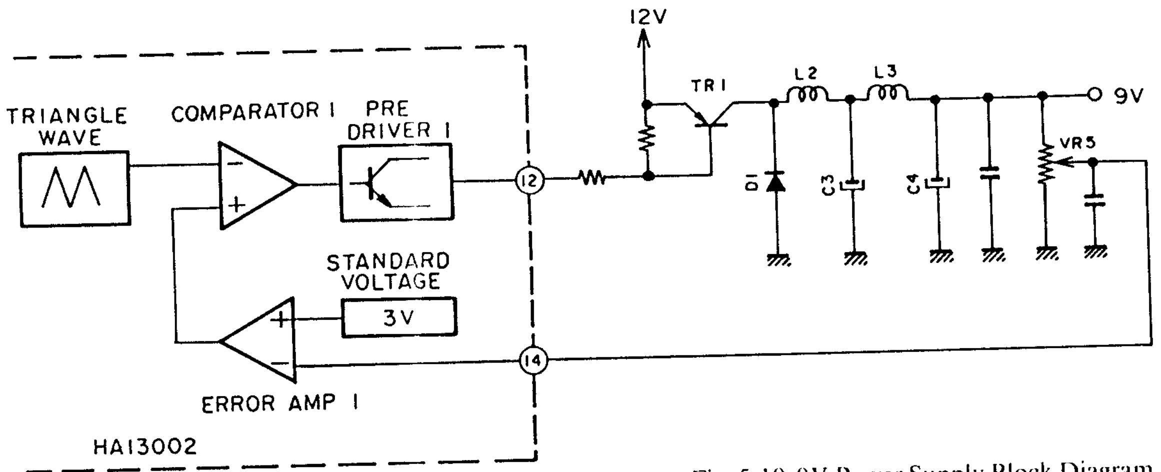

12V
TRIANGLE WAVE
COMPARATOR 1
PRE DRIVER 1
TR1
L2
L3
9V
VR5
D1
C3
C4
⑫
STANDARD VOLTAGE
3V
⑭
ERROR AMP 1
HA13002

Fig. 5-10 9V Power Supply Block Diagram

As shown in Fig. 5-10 the output voltage reduced by the potential divider VR5 is supplied to pin ⑭ of IC (HA13002), and any deviation from the reference voltage (3V) is amplified by the error amplifier.

If the 9V supply output is increased, the level at pin ⑭ increases, and the error amplifier output falls below the normal value. On the contrary, if the output is decreased, the error amplifier output increases. Subsequently, this output is compared with the triangular wave (about 40 kHz) of the reference oscillator.

As long as the ⊕ input level (error amplifier output) of the comparator is higher than the ⊖ input level (triangular wave), the comparator output remains "HIGH", which causes the pre-driver to operate, resulting in the switching transistor being turned ON/OFF (Fig. 5-11). The input voltage that is turned ON and OFF intermittently is smoothed by an LC filter and then supplied to the output.

When the 9V supply output drops, the error amplifier output increases, causing the switching ON period to be lengthened (see Fig. 5-12). This causes the output to increase, bringing it back to the normal value. Inversely, if the 9V supply output increases, the switching ON period is shortened, thereby permitting the output to be maintained at a constant level (Fig. 5-12).

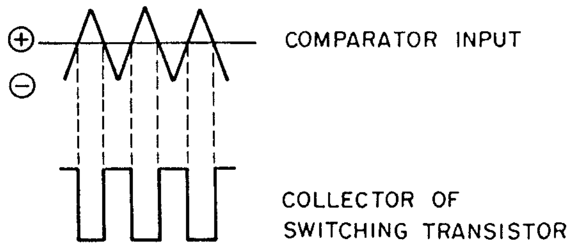
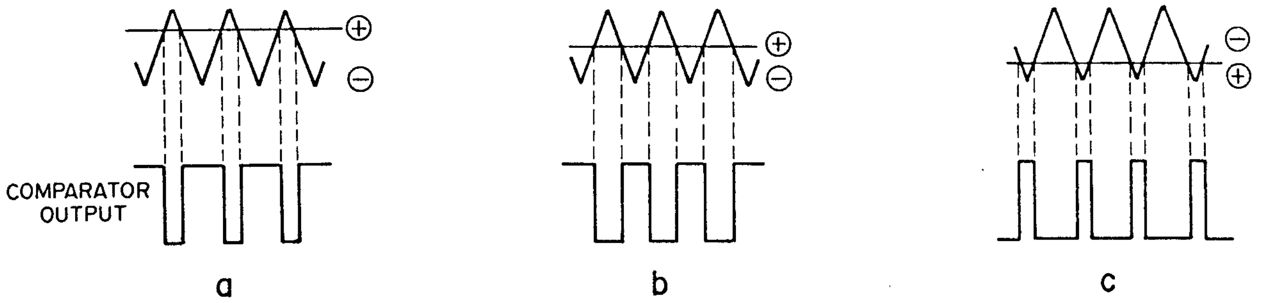

⊕
⊖
COMPARATOR INPUT
COLLECTOR OF SWITCHING TRANSISTOR

Fig. 5-11 Comparator operation


⊕
⊖
COMPARATOR OUTPUT

a b c

Fig. 5-12 Comparator input/output

3-1-3. Reel Motor Power Supply (RPW) (Fig. 5-13)

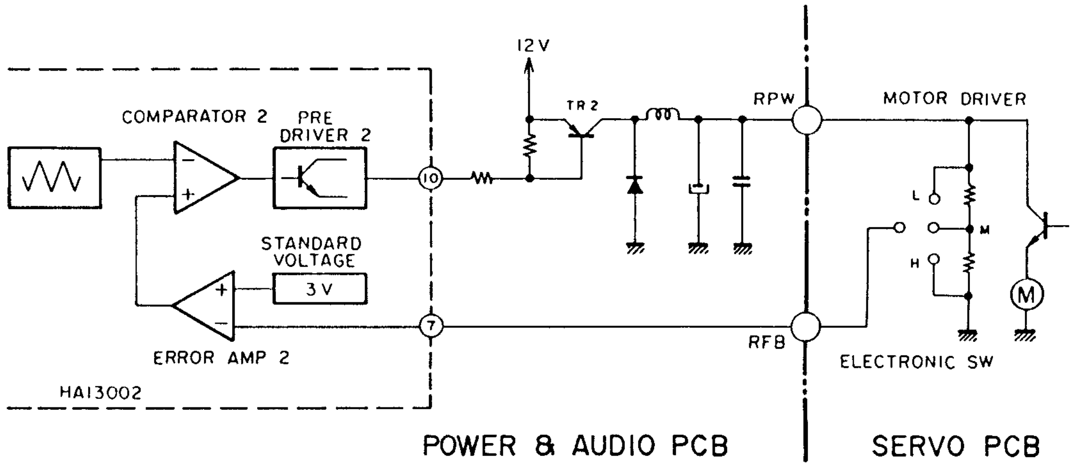

12V
COMPARATOR 2
PRE DRIVER 2
TR2
RPW
MOTOR DRIVER
⑩
STANDARD VOLTAGE
3V
L
M
H
M
⑦
RFB
ERROR AMP 2
ELECTRONIC SW
HA13002
POWER & AUDIO PCB
SERVO PCB

Fig. 5-13 Reel Power Block Diagram

This power supply has its output changed in 3 steps depending on to video operation mode selected, so as to control the number of revolutions and torque of the reel motor. This is done by the electronic mode on the servo PCB which is controlled by a Micro computer.

Mode	Reel Feedback (RFB)	Reel Motor Power Supply (RPW)
PB, REC	Low	about 3V
REVIEW	Middle	about 6V
FF, REWIND, UNLOAD	High	about 12V

The ⊖ input of the error amplifier is supplied with RFB reduced by this RPW division ratio switching according to VTR mode. This causes the power supply output voltage to be varied. Constant-voltage control is provided in the same manner as in the 9V power supply circuitry.

3-1-4. Drum Motor Power Supply (DPW) (Fig. 5-14)

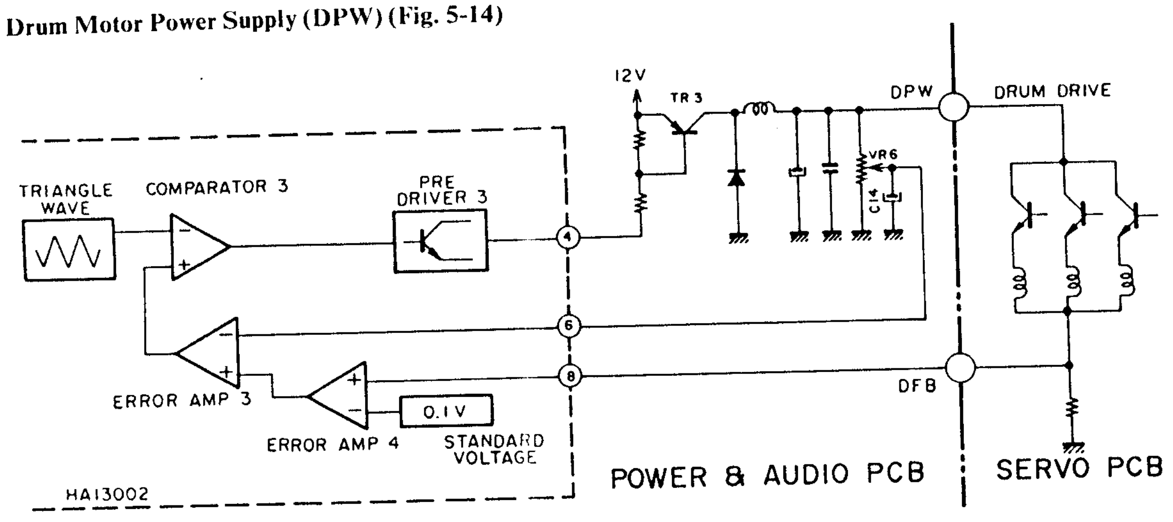

12V
TR3
DPW
DRUM DRIVE
VR6
C14
TRIANGLE WAVE
COMPARATOR 3
PRE DRIVER 3
4
6
8
ERROR AMP 3
ERROR AMP 4
0.1V
STANDARD VOLTAGE
DFB
HA13002
POWER & AUDIO PCB
SERVO PCB

Fig. 5-14 Drum Power Block Diagram

The drum motor normally requires 6 ~ 8V. It requires 12V or so at start-up time, however. For this reason, the potential across the current detecting resistance providing DRUM Feed-Back (DFB) is compared with the reference voltage (0.1V) and then with the potential at pin 6 (output detection) and then amplified so as to control the pulse width. To provide the large current required at start-up time, the DFB potential is increased, causing the output of the error amplifier 4 and 3 to be increased, which in turn widens the ON period of switching transistor (TR3), resulting in increased drum motor drive voltage. This arrangement, which can prevent an unnecessarily large voltage from being applied to the drum motor, permits the use of a drum motor drive transistor with a small Pc, with the resulting reduction in power loss.

3-1-5. Capstan Motor Power Supply (CPW) (Fig. 5-15)

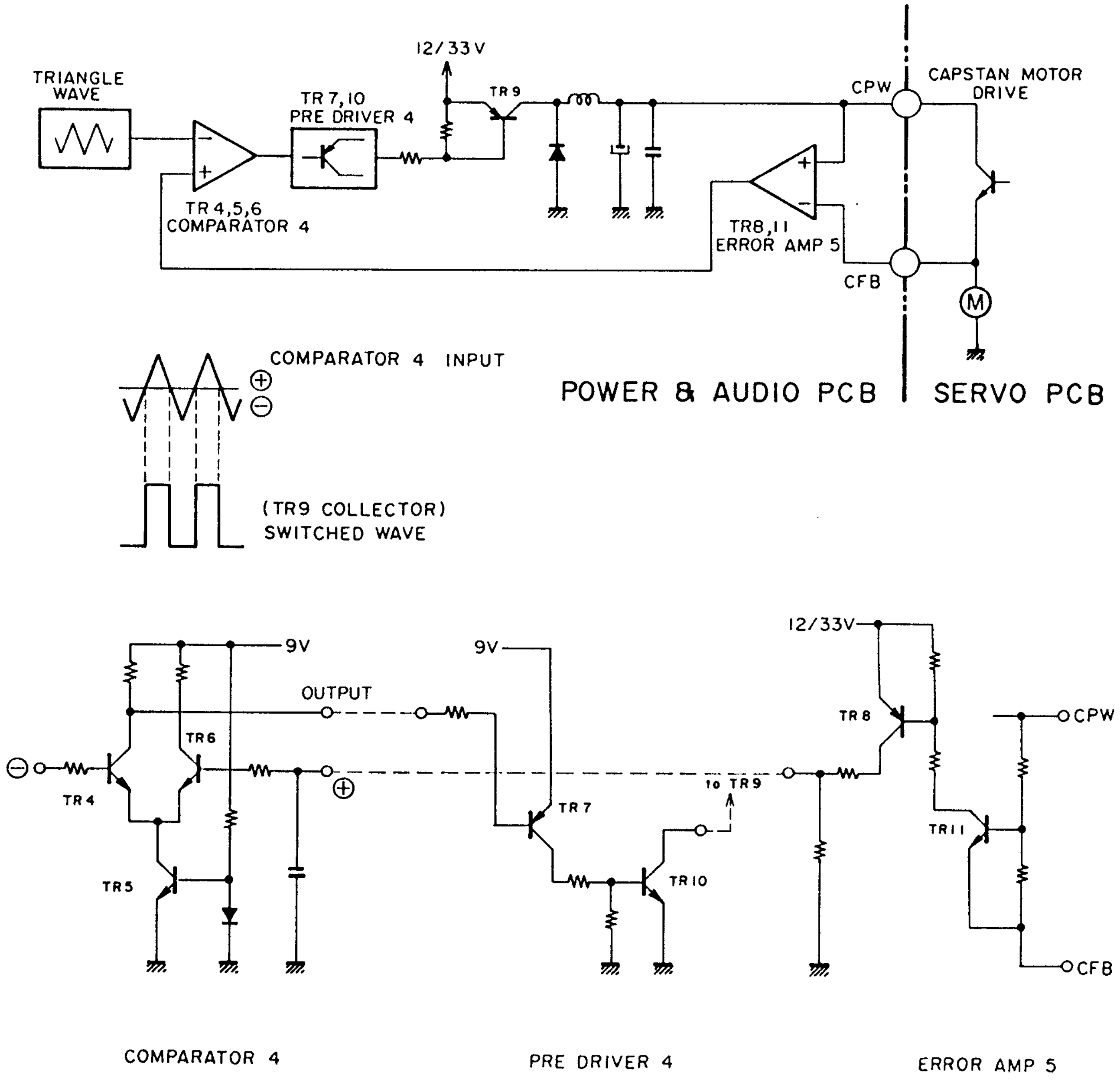

12/33V
TRIANGLE WAVE
TR7,10 PRE DRIVER 4
TR9
CPW
CAPSTAN MOTOR DRIVE
TR4,5,6 COMPARATOR 4
TR8,11 ERROR AMP 5
CFB
M
COMPARATOR 4 INPUT
⊕
⊖
(TR9 COLLECTOR) SWITCHED WAVE
POWER & AUDIO PCB
SERVO PCB
9V
OUTPUT
TR6
TR4
TR5
9V
TR7
TR10
to TR9
12/33V
TR8
TR11
CPW
CFB
COMPARATOR 4
PRE DRIVER 4
ERROR AMP 5

Fig. 5-15 Capstan Power Block Diagram

A high voltage (33V) is applied to the motor only when it becomes necessary to increase the voltage (e.g., at start-up time, CUE/REVIEW mode, etc.). Fluctuation of the capstan feedback (CFB) potential provided by the emitter of the capstan motor drive transistor, is detected by the error amplifier 5 (TR8, 11) and then comparison is made with the triangular wave at the ⊖ input (base of TR4) by the comparator 4 (TR4, 5, 6) to provide control over switching transistor (TR9).

Load	Emitter of capstan motor drive TR	Error amp 5 output	SW TR "ON" period	Capstan power output
Heavy	Rises	Drops	Lengthens	Rises
Light	Drops	Rises	Shortens	Drops

In the manner shown above, the voltage between emitter and collector of the capstan motor drive transistor is kept almost constant (about 2V), resulting in reduced power loss.

3-2. THE AUDIO CIRCUIT

The IC used in the audio circuit is BA5102.
With BA5102, the REC/MUTE/PB control circuit and analog switch (electronic switch for REC/PB switching) as well as the REC/PB pre-amp, line amp, REC amp and AGC are all integrated on a single chip. Its advantage is that no relay is required in REC/PB switching and switching noise is minimized. However, since only a microphone amplifier input is available, an attenuation as high as 50 dB is required for line input (– 20 dBm), making the S/N ratio not quite satisfactory. In spite of this, BA5102 does help to simplify the circuitry.
The following describes each of the five control signals used to control the audio circuit.

3-2-1. Signal Flow

Note:
All pin numbers refer to IC BA5102.

1) EE Mode:
Both LINE IN (–20 dBm) and MIC IN (–70 dBm) input facilitis are available. However, since only a microphone amplifier is available, an attenuator (50 dB) is inserted in the LINE IN circuit to match both the input levels at –70 dBm. The signal is supplied to pin ⑱ through R30 (input resistance for AGC), and then routed via pin④to the pre-amplifier and then via pin ⑨ to the line amplifier input. There, the signal is grounded by the electronic switch during PB (A. PB = High) or MUTE. (This MUTE is the one within IC rather than the one associated with O. MUTE.....A. PB = Middle) to prevent interference from other signals. The output amplifier (TR14) is responsible for the adjustment of frequency characteristics and the muting of the output by the control signal O. MUTE. This output is supplied to AUDIO OUT (5 PIN DIN), headphone amplifiers TR16, 17 and 18, and to the AGC detection circuit. In the AGC circuit, the impedance between pin ⑰ and GND varies depending on the detection level, and the input level is reduced according to the division ratio provided by R30. In addition, the AGC is reset within the IC during playback, thereby preventing the AGC from still functioning when the EE mode is established after playback of a tape with a high audio record level.
2) PB Signal Flow
The audio signal picked up by the R/P head is supplied to the equalization amplifier through pin ② . After its low frequency range is de-emphasized by R58, R59, and C47, the signal is supplied to pin ⑧ via VR3 (PB level adjustment). Just as with pin ⑨ , the signal supplied to pin ⑧ is grounded by means of control signal, A. PB "L" (REC mode) and A. PB "Middle" (Mute mode). Subsequently, the audio signal is connected to the output and headphone amplifiers.
3) REC Signal Flow:
The audio signal is supplied to the REC amplifiers (pin 12) from the line amplifier output (pin 10) via VR2 (REC level adjustment).
C27, L10 and R35 (REC peaking) connected to pin ⑪ emphasize the high frequencies during recording to compensate for various recording losses. The signal mixed with bias is supplied to the R/P head. (The bias current value is determined by detection of the voltage between the ends of the head's 10Ω and can be adjusted by VR4.)
In addition, "erase" current is made to flow from the bias oscillation circuit to the FULL ERASE (FE) and AUDIO ERASE (AE) heads to provide full-width and audio-channel erasure.
4) SOUND DUB SIGNAL FLOW:
RL-2 is switched to the dummy coil (one equivalent to FE head inductance) by means of the control signal FE so as to prevent the erase current from flowing through the FE head. For the rest, information given in ©REC SIGNAL FLOW also applies.

3-2-2. Audio Playback (A. PB) Control Signal (Fig. 5-16)

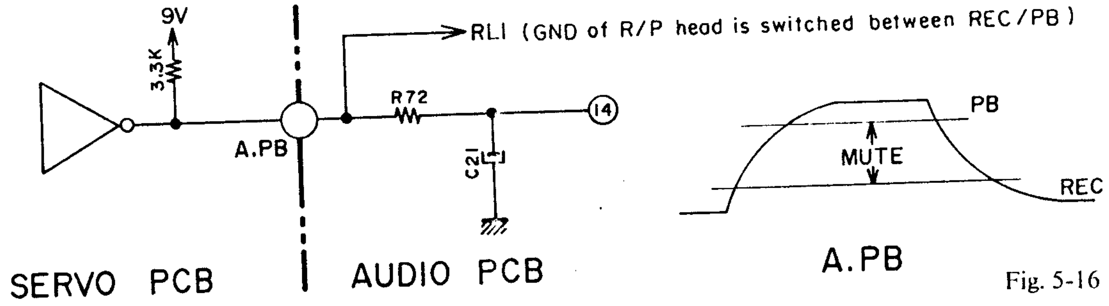


Fig. 5-16

This control signal is supplied to pin 14 of the IC BA5102. If A. PB is at "H", the electronic switch is changed over to PB, whereas if it is at "L", the switch is changed over to REC.

Switching between "H" and "L" is done gradually with the time constant provided by R72 (3.3K) and C21, thereby preventing the generation of switching noise. In addition, the switching relay (RL-1) for the R/P head is also controlled.

3-2-3. Audio Record (A. REC) Control Signal (Fig. 5-17)

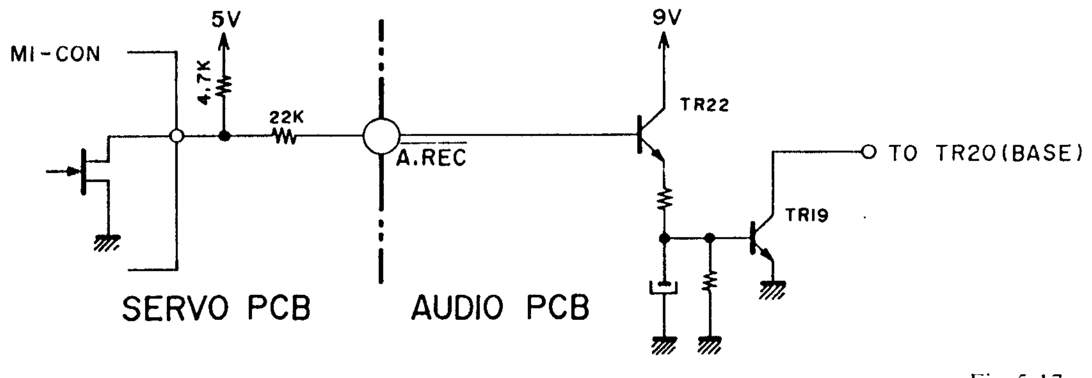


Fig. 5-17

This signal provides control over the bias oscillation level: Where sound is not recorded (i.e., other than RECORD or SOUND DUB), the A. REC signal that is at "H" activates transistors TR22 and TR19, which switch off the bias oscillation.

3-2-4. Full Erase (FE) Control Signal (Fig. 5-18)

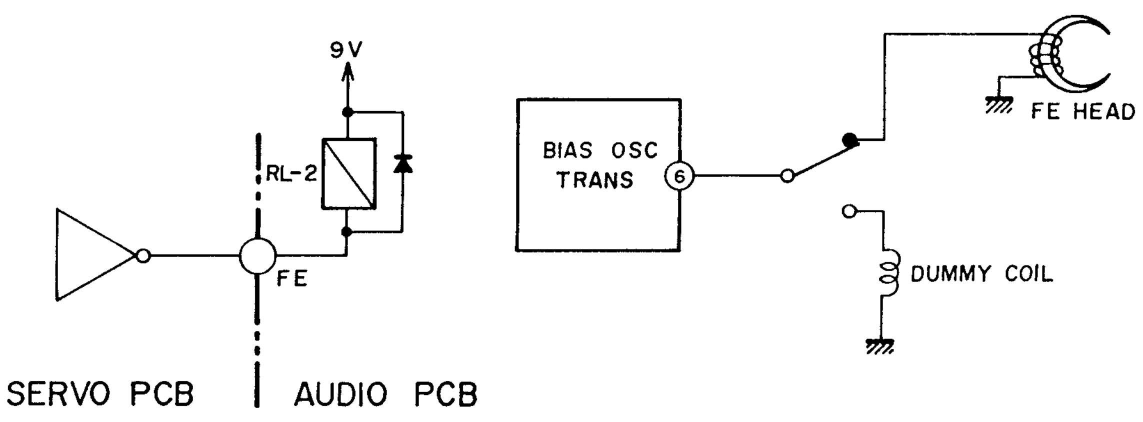


Fig. 5-18

3-2-5. Record Mute (R. MUTE) Control Signal (Fig. 5-19)

This control signal mutes the recording signal by activating TR13.

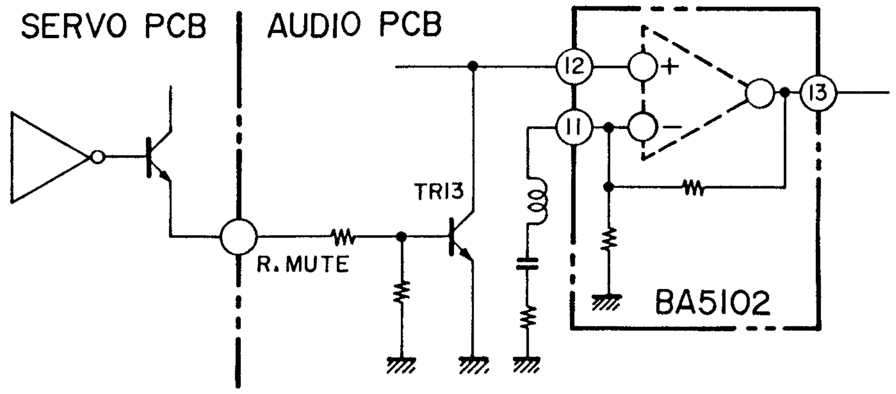
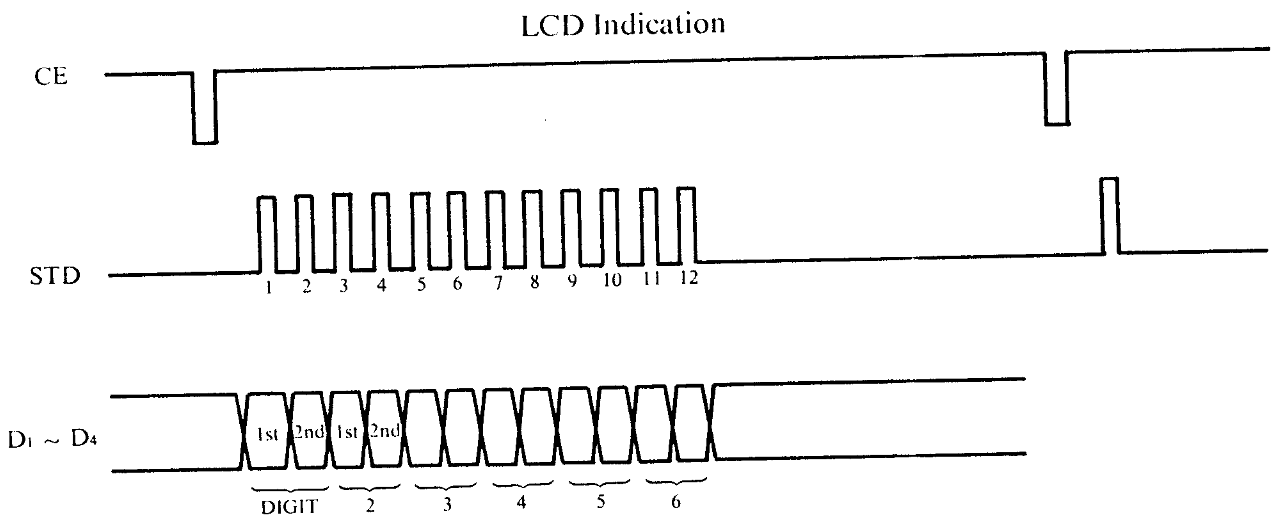


Fig. 5-19

When PAUSE is pressed in the SOUND DUB mode, the tape is moved slightly even after "PAUSE" is initiated, to produce a noise-less still picture. Therefore the tape is stopped after RECORD MUTE is applied, so as to avoid recording incomplete audio signals.

Also, if bias was stopped for each pause, a portion of the tape would be left unerased because the tape is moved after "PAUSE". Therefore bias oscillation is maintained even when PAUSE is pressed in the SOUND DUB mode.

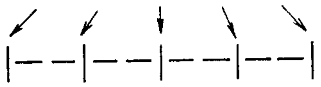
4-2-11. LCD Display System


LCD Indication

DATA D_1 to D_4, each signal composed a pair of 4-bit signals, therefore sending 6 pair of DATA.

DATA DIGIT	1st				2nd			
	D_4	D_3	D_2	D_1	D_4	D_3	D_2	D_1
5	R	M	H	X (1)	– (5)	ϕ	ϕ	ϕ
1 ~ 4	i (2)	H (3)	H	$\overline{Z}$ (4)	X	X	X	X (6)

(1) Don't care
(2) Battery display
(3) Battery display sections (always H)



(4) $\overline{Z}$ is always H in VP-88.
(5) Test display
(6) Counter display: 0 to 9

Fig. 5-36

VP-88 uses a liquid crystal display (LCD) device to provide counter, battery, memory, and repeat displays. These displays are all controlled by the Syscon microcomputer. Necessary data is transferred using some of the O- and R-ports on the Syscon microcomputer.
The IC mounted in the LCD display unit incorporates data processing, latch, and display driver functions.
The CE (chip enable) signal, CLK (clock) and 4-bit data are transferred from the Syscon microcomputer.

4-2-12. POWER ON Circuit

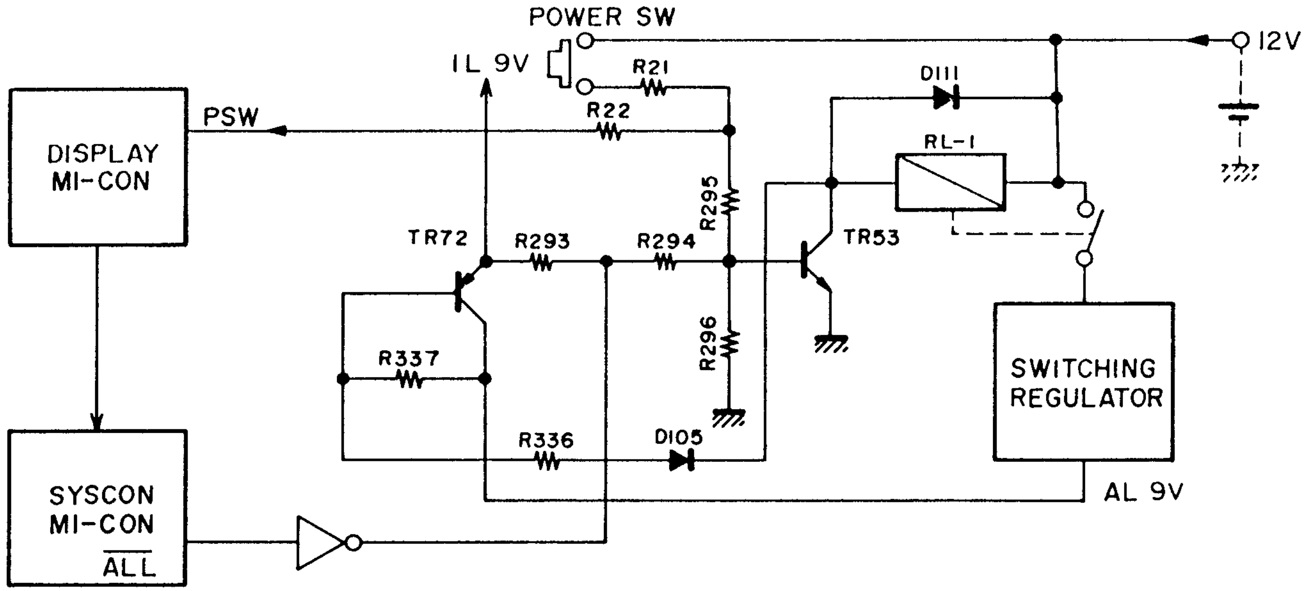


Fig. 5-37

With VP-88, a touch switch is used as the power switch, resulting in a somewhat complicated circuit design.
The POWER ON circuit must be described separately for operation from a battery and from an external power supply, because microcomputer-related components are in operation even when the POWER switch is not activated, when an external power supply is used.

1) Battery operation
   The operation of the microcomputers stops unless the power switch is activated.
   With the power switch activated, the base of TR53 is set to "H" through R21 and R295. As a result, TR53 is activated and 12V is supplied to the switching regulator. Since activating TR53 also activates TR72, AL9V is routed to IL9V, and the microcomputers start to operate.
   Then, the fact that the power switch has been activated is transmitted to the display microcomputer via R22, and the ALL voltage is sent out from the Syscon to keep TR53 ON even after the power switch is deactivated.
   All this is carried out the moment the power switch is activated.
2) Operation form extend power supply
   As in the case of the battery, TR53 is also activated when the power switch is activated. This, however, does not have much significance, since the microcomputer operation is already in progress. With the power switch activated, the "power ON" signal is sent to the display microcomputer, causing the $\overline{ALL}$ voltage to be sent out from the Syscon, which in turn results in TR53 being turned on.
   (Note that TR53 stays ON since $\overline{ALL}$ is not removed until the power switch is deactivated.)
   The display microcomputer is so programmed that it is turned ON or OFF each time the signal is received at the power switch. R22 is for preventing $\overline{ALL}$ from being routed to the display microcomputer, while R293 is used as a pull-up resistance for the buffer. The purpose of D105 is to prevent reverse current from the 12V supply.

4-1-2. SEARCH FUNCTION

Where recording is interrupted for a long time, more power saving can be achieved with STOP or POWER OFF than with PAUSE. Pressing the REC SEARCH button can be accepted only after STOP. Use of REC SEARCH immediately before the next REC operation, permits the condition formerly associated with REC PAUSE to be established. The REC SEARCH function proceeds as follows:

After loading, the tape position where the CTL pulse has been interrupted for 0.1 second or more is sought for a maximum of 5 seconds or so*, at 9 times the normal speed. Upon detection of the position where the CTL pulse is interrupted, the brake is activated immediately, and the tape is rewound at three times the normal speed, for a period equivalent to 50 CTL pulses**, as it does, when the PAUSE button is pressed during the RECORD mode. After this, the PAUSE mode is established.

*1) If the CTL pulses are not interrupted even after a lapse of 5 seconds, the tape position reached with the lapse of 5 seconds is regarded as the end of the recording.

2) If not a single CTL pulse is encountered (e.g., on a virgin tape), the search operation is stopped with a lapse of 0.3 second, and the tape position at that time is regarded as the end of the recording.

** If CTL pulses have not been encountered or have been interrupted, the PAUSE state is established (rewinding is stopped) 1.9 seconds after the rewinding operation is started.

4-1-3. REC. CANCEL FUNCTION

The REC. CANCEL function may be used in two different ways depending on the time at which the REC CANCEL button is pressed (which can only be accepted during REC mode).

1) When the REC CANCEL button is pressed within 4.8 seconds (or 120 CTL pulses) after the REC button is pressed:
   The mode display is changed immediately to PAUSE, and the tape is rewound at three times the normal speed to the point where the REC button was pressed. After this, the PAUSE mode is established.
2) When the REC CANCEL button is pressed after a lapse of more than 120 CTL pulses since the REC button was pressed:
   The mode display is changed immediately to PAUSE, and rewinding is performed at three times the normal speed. In this case, the video recording just made is played back as the rewind operation proceeds. This feature permits the user to press the PAUSE/STILL button* when the picture he does not want to erase appears during the review operation at three times the normal speed, thereby making it possible to recommence shooting at that point on the tape.
   * Pressing the PAUSE/STILL button causes switching to the EE system. The tape is further rewound as much as 50 CTL pulses before the PAUSE mode is established.

4-1-4. EDITING FUNCTION

When the PAUSE/STILL button is pressed in the actual RECORD state (i.e., the state established 40 CTL pulses* after the REC button is pressed), the tape is rewound as much as 50 CTL pulses at three times the normal speed before the PAUSE mode is established.

If the PAUSE/STILL button is pressed before the CTL pulse count reaches 40 with the REC button pressed, the tape is wound back to the point where the REC button was pressed and then the PAUSE mode is established just as in a of 4-1-3. above.

* The REC mode is always established after a lapse of 1.9 seconds (maximum) to ensure proper functioning even when CTL pulses are interrupted or are not encountered.

4-1-5. REPEAT FUNCTION

This function can be accepted only during the playback mode (PLAY, PAUSE/STILL, SLOW, CUE or REVIEW). When accepted, "R" is displayed on the LCD. (This, however, indicates temporary acceptance).

If the REPEAT button is pressed again while "R" is being displayed, the repeat operation is cancelled and the "R" disappears (the "toggle" action).

When, after temporary acceptance, the REW button is pressed at the point up to which playback is to be subsequently repeated, the corresponding counter number is memorized. The PLAY function is started when Memory Stop or Tape Start is detected. When the count has reached the memorized counter number, the REW mode is established automatically. This procedure is repeated until the REPEAT mode is cancelled when the 8th PLAY is completed.

If a button other than REW is pressed after temporary acceptance, the REPEAT mode is cancelled and "R" goes out. In addition, once the REPEAT mode has been established by pressing the REW button, the REPEAT mode remains valid until the STOP button is pressed. This means that FF, REVIEW, PAUSE/STILL, etc. may be accepted during the REPEAT mode.

4-1-6. INSERT FUNCTION

Both video and audio can be inserted in an uninterrupted fashion by recording without performing the Full Erase operation.

1) When the INSERT button is pressed in the PLAY-STILL mode:
   Switching is made from STILL to EE; the tape is rewound as much as 50 CTL pulses at three times the normal speed and then the PLAY-INSERT-REC-PAUSE state is established.
   Subsequently, by pressing the REC button, pictures only can be recorded during the insertion process.
2) When the INSERT button is pressed in the SOUND DUB-STILL mode:
   The SOUND DUB-INSERT-REC-PAUSE state is established as in 4-1-6,1 above. By pressing the REC button, both sounds and pictures can be recorded during the insertion process.
3) The INSERT operation is normally terminated at the point where the STOP button is pressed. However, since the INSERT function can be used in combination with the REPEAT function, it is possible to insert video and/or audio between two separate chosen points on the tape.

4-1-7. OTHER FUNCTIONS

1) DEW detection
   When dew is detected during the normal mode, the mechanism is placed in the STOP state and the LCD flashes to notify the user of the dew condition. The LCD stops flashing when there is no more dew detected. Under the DEW condition, only EJECT or POWER OFF can be used. Note that when the test mode is established, the LCD stops flashing.
2) Lamp failure detection
   Complete lamp failure or increased resistance due to lamp failure causes the power to be turned off. The tuner (VU-88), will display "BREAK DOWN" if it is connected to the VP-88.
3) Lamp power saving function
   With a normal mode except FF, REW, CUE or REVIEW, the lamp is made to glow on a 1/9 duty cycle for about 0.3 second at intervals of about 2.3 seconds, thereby reducing the power consumed by the lamp.
   With the test mode, the lamp is not made to blink (i.e., is kept on). The lamp does not come on at EJECT time.
4) Auto-REW function (in playback mode)
   When "Tape End" is detected in the PLAY or CUE mode, the REW operation is performed automatically. If "Tape End" is detected in a mode other than these playback modes, the tape is rewound only to the begining of the end-of-tape leader and then the REW operation is stopped.
   Additionally, the tuner (VU-88) is notified that the TIMER operation cannot be performed.
5) CAMERA-REMO-CON (CAMERA REMOTE CONTROL)
   If PAUSE is established on the camera, the PAUSE mode continues even when the REC button on the VR-88 is pressed, so that it is not possible to establish REC from the VTR body.
   When RUN is established on the camera, the PAUSE mode is cancelled, and the REC mode established. At this time, PAUSE can be re-established from the VTR body. Note that these operations involve sending out the REC-TALLY signal to the camera.
6) Battery check/display
   The battery voltage is displayed on the LCD using horizontal bars as follows:

   Note that if the display on the LCD goes out because of a voltage drop below 10.8V, the power will be turned off a few seconds later.
7) 2-second audio mute (at POWER-ON time)
8) Reel-Stop detection
   The revolution of the supply reel (in the case of REVIEW or AEC-REWIND* or the take-up reel (in cases other than REW or AEC-REWIND) is sensed.

FF/REW ..... 0.1 sec.
CUE/REVIEW .. 0.5 sec.
PLAY/SOUND DUB/REC .. 1.9 sec.

If the reel pulse is not encountered even after the lapse of time given on the left, "Reel Stop" is assumed.

*AEC = Automatic Edit Control

9) Drum-Stop detection
   When SWP (the switching pulse) corresponds to 9 Hz or less, "Drum Stop" is assumed. Note that with the test mode, neither "reel stop" nor "drum stop" detection takes place.
10) Tape count
   The tape counter provides accurate counting through the use of the reel pulse's rising edge during take-up and its falling edge during rewinding.
11) The REC power supply and REC MUTE signal are turned ON synchronously with the rising of the SWP.
12) Loading error detection
   If the loading or unloading does not proceed normally, the power is turned off immediately. In this case, if the tuner (VU-88) is connected, it will display "BREAK DOWN".
13) Test mode
   The TEST mode is turned ON/OFF each time the TEST pin goes to GND. The TEST mode is displayed on the LCD using a minus (−).
   The TEST mode differs from the normal mode in that:
   - **Neither the reel drum is stopped.**
   - STILL/PAUSE is not cancelled on a time basis.
   - Lamp failure is not detected.
   - Tape Start or Tape End are not detected.
   - Lamp stay ON (except for EJECT) when power is ON.
   - The display does not blink even with cassetteless/EJECT.
     Any button on the VTR can be accepted.
   - DEW is not detected, and DEW OFF results if DEW condition is already established.
   - RECORD SAFETY SWITCH is not operative (REC is always allowed.).

4-1-8. SPECIFICATIONS WITH VU-88 IN USE

1) The Timer-REC function can be used if:
   - The cassette loaded into the VP-88 does not have its RECORD Safety Tab removed.
   - The tape has been rewound or the cassette has been changed after detection of the end of tape.

   Therefore, if the end of tape is encountered during the TIMER-REC mode, the REC function cannot be performed (i.e., the REC-STANDBY cannot be established) unless the condition in 2 has been met.
   This applies even when the timer has been set.
2) If the end of the tape is detected during the TIMER-REC mode, the power will be turned off immediately after the STOP operation.
3) With SLEEP, the power is turned off only when the SLEEP time is over. Therefore, if the operation is stopped when detection of the end of tape occurs (as with TIMER-REC), the power is kept ON until the "sleep" time is over.
4) The timer operation can be cancelled by pressing the STOP or FUNCTION-OFF Switch (VU-88) during the TIMER-REC or SLEEP mode.
5) The channel selected cannot be altered during the PLAY, SOUND DUB or REC modes. (This, however, does not apply to PAUSE/STILL.)
6) The SLOW speed can be changed by means of the UP/DOWN button on the remote controller only during the SLOW MOTION mode.
   1/4 - 1/5 - 1/7 - 1/10 - 1/19
   UP ←——— ———→ DOWN

4-2. SYSCON CIRCUIT DESCRIPTION

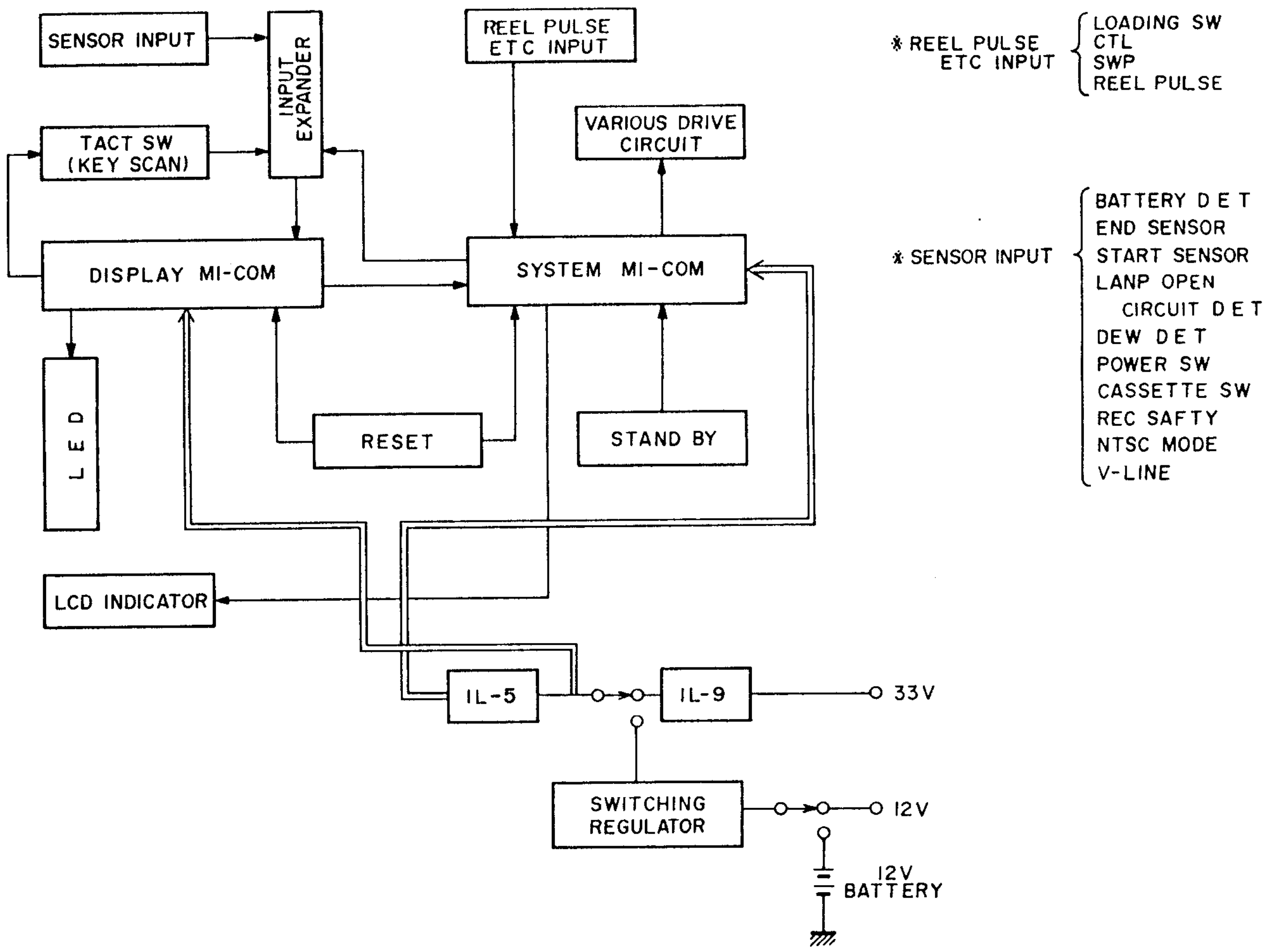

SENSOR INPUT
INPUT EXPANDER
REEL PULSE ETC INPUT
VARIOUS DRIVE CIRCUIT
TACT SW (KEY SCAN)
DISPLAY MI-COM
SYSTEM MI-COM
LED
RESET
STAND BY
LCD INDICATOR
IL-5
IL-9
33V
SWITCHING REGULATOR
12V
12V BATTERY
* REEL PULSE ETC INPUT
LOADING SW
CTL
SWP
REEL PULSE
* SENSOR INPUT
BATTERY DET
END SENSOR
START SENSOR
LANP OPEN CIRCUIT DET
DEW DET
POWER SW
CASSETTE SW
REC SAFTY
NTSC MODE
V-LINE

Fig. 5-21 VP-88 Syscon Block Diagram

4-2-1. Reset Circuit

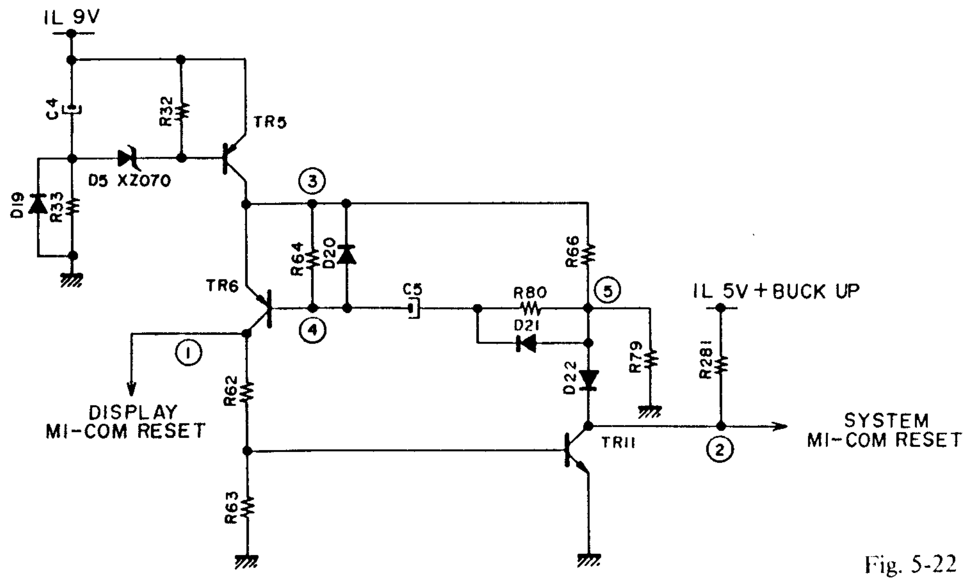

IL 9V
C4
R32
TR5
D5 XZ070
D19
R33
③
R64
D20
R66
TR6
C5
R80
D21
⑤
IL 5V+BUCK UP
④
①
R62
D22
R79
R281
DISPLAY MI-COM RESET
TR11
②
SYSTEM MI-COM RESET
R63

Fig. 5-22

With a microcomputer, the reset operation is always required at power ON time in order , for example, to prevent the program from starting at a wrong address. On VP-88, the circuit action is rather complicated because two microcomputers that differ both in voltage and polarity are used.

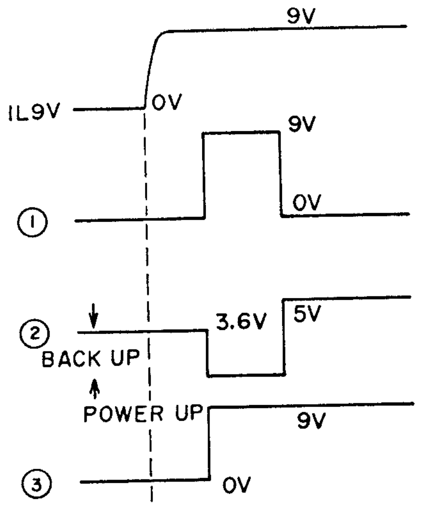


Fig. 5-23

When initiating "Power Up", the charging of C4 is started. When the charging voltage exceeds 7.6V, TR5 is activated, which switches the power to the reset circuit proper, consisting of TR6 and TR11. When supplied with the power through TR5, TR6 is activated by the voltage which is determined by R64, R80, R66 and R79. This causes TR11 base potential to go to "H", resulting in TR11 being activated immediately. As a result, 8.4V and 0V are made available at points ④ and ⑤, respectively, and the charging of C5 is started. When the charging of C5 is almost complete, the voltage at point ④ becomes 9V, deactivating TR6. (TR11 is also deactivated.) Thus, the period of time during which the reset pulse is ON is determined by the time constant of C5 and R80. D19, D20 and D21 are diodes used to discharge C4 and C5 for rapid power Up-Down sequence. D22 is used to provide protection by preventing a reverse current; this is necessary since point ② is backed up by a battery when IL9V is not available.

4-2-2. Battery Voltage Detection Circuit

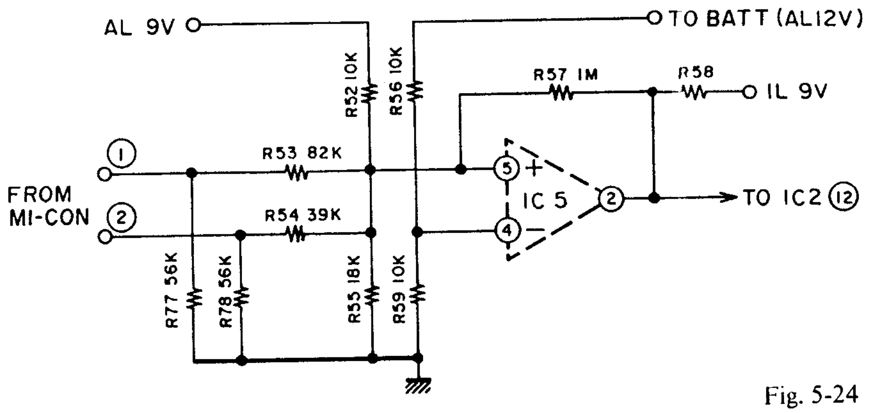


Fig. 5-24

To show the discharged condition of the battery when it is in use, the voltage is displayed in four steps. That is, a 4-step reference voltage from the microcomputer is compared in an operational amplifies (OP amp) with the battery voltage, and the result is read by the microcomputer for display on the LCD.

The inverse terminal of the operational amplifier (OP AMP) is supplied with a voltage obtained by dividing the actual battery voltage by "2", whereas the specific inverse terminal is supplied with a 4-step voltage (5.4V, 5.9V, 6.2V and 6.5V) as determined by 6 resistances (R52, R55, R53, R54, R77 and R78). The 4-step voltage is based on the four possible combinations of the signals 1 and 2 from the microcomputer; i.e., (0, 0), (1, 0), (0, 1) and (1, 1), with each of the signals being set to L (0V) or H (9V). The difference in voltage between the inverse terminal and the specific inverse terminal is amplified to 9V by the OP AMP before being sent back to the microcomputer.

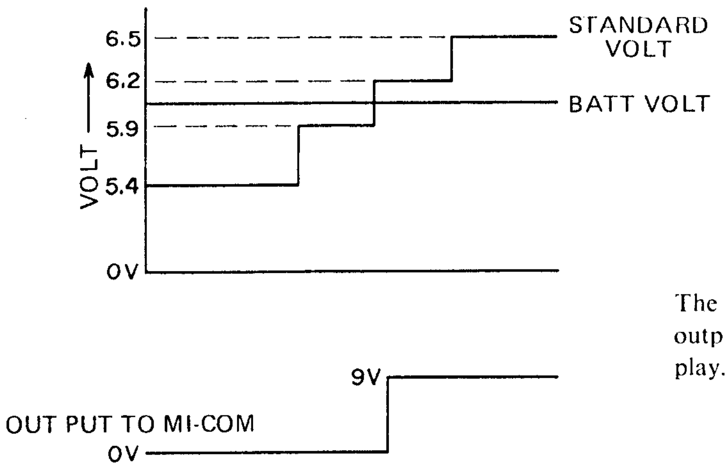
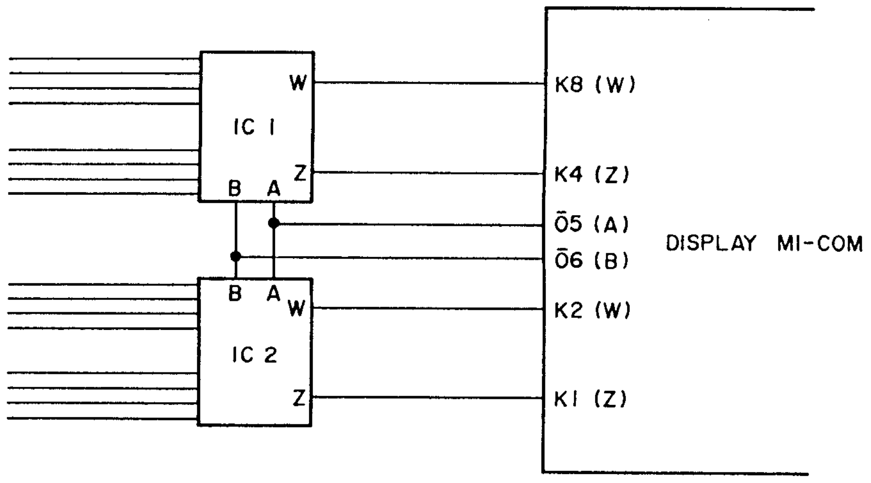


Fig. 5-25

The microcomputer detects the inversion of the OP AMP output as illustrated at the left to provide the BATT display.

4-2-3. Input Expander



A, B INPUT	ϕϕ	ϕ1	1ϕ	11
K$_8$	SI	SI	CSW	CRDIS
K$_4$	KSC2	CP	RSW	V-LINE
K$_2$	KSC1	BATT	ES	L-NG
K$_1$	KSCO	DEW	SS	PSW

SI	:	Data to be transferred from VU.
KSC	:	Key scan
SIN	:	Data to be transferred from SYSTEM microcomputer
CP	:	Camera PAUSE
BATT	:	Battery detection
DEW	:	Dew detection
CSW	:	Cassette switch
RSW	:	Recording suppression switch
ES	:	End sensor
SS	:	Start sensor
CRDIS	:	CUE REVIEW suppression switch (NTSC mode)
V-LINE	:	Video line
L-NG	:	Lamp failure detection
PSW	:	Power switch

Fig. 5-26

The DISPLAY microcomputer has only four input ports (K inputs), and thus a multiplexer consisting of IC2 and IC3 (both are MC14539) is used to increase the number of ports available to 16. Two SELECT outputs (O_5 and O_6) are used to select the inputs to the CMOS. The 14 inputs are:-

4-2-4. Standby Circuit

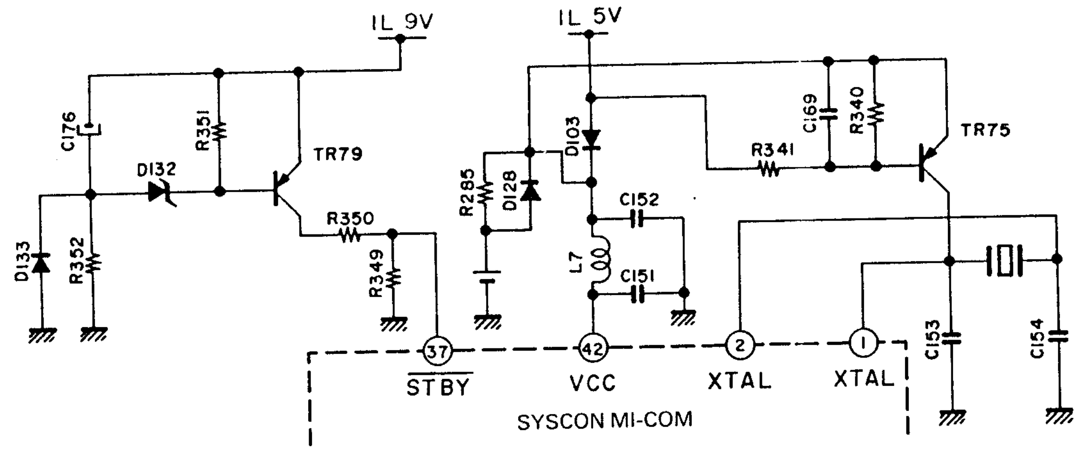


Fig. 5-27

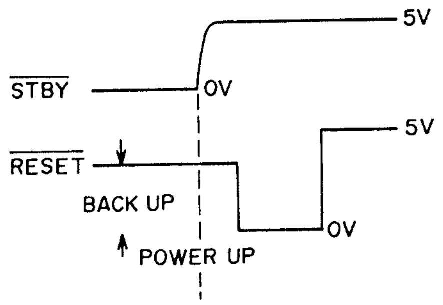


Fig. 5-28

The contents of the counter on the LCD display are retained in a RAM (random access memory) on the Syscon microcomputer.

If the power to the Syscon microcomputer is turned off, the RAM contents will be destroyed. To avoid this, backup is provided for the Syscon microcomputer. However, the amount of current required when backup is effected with the microcomputer in operation can be reduced by stopping the operation through setting the microcomputer's standby terminal to "L". At this time, the clock is also stopped.

The basic operating principle applied to the reset circuit also applies to the circuit built around TR79. When initiating "Power Up", the charging of C176 is started.

When the charging voltage exceeds D132 + 0.6V = 7.6V, TR79 is activated, causing "standby" to be cancelled. Vcc is backed up by the battery, and charging continues via R285 as long as IL5V is available. When IL5V is no longer available (Power Down), the current is made to flow to the microcomputer through D128.

On the other hand, TR75 stays off as long as IL5V is available. It is activated upon "Power Down", causing the crystal (Xtal) terminal to go to "H" which stops the clock.

It should be noted, however, that even when backup is provided, the contents of the RAM will be destroyed if the timing determined in conjunction with the RESET operation is incorrect. The incorrect timing refers to the overlapping of standby and reset states as shown below:

4-2-5. Function Plunger Drive Circuit

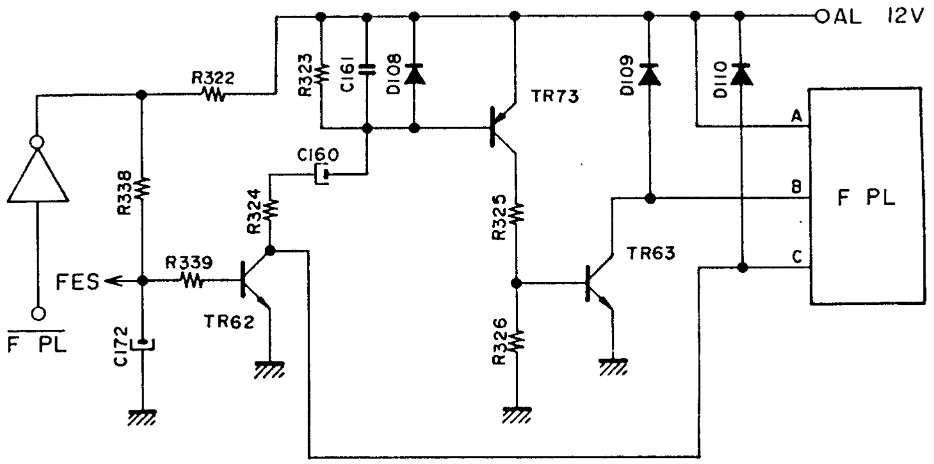


Fig. 5-29

The function plunger (F-PL) is a 3-terminal type.
When $\overline{\text{F-PL}}$ goes to LOW level, the base of TR62 goes to "H" after a lapse of time determined by the time constant of R338 and C172, causing TR62 to be activated. The Function Plunger has 12V applied between A and C, but since this winding acts as a retainer, the plunger will not retract. When TR62 is activated, the charging of C160 is started via R323. This causes the base of TR73 to be at LOW level, and therefore is activated.

At the same time, TR63 is also activated and 12V is applied not only between A and C but also between A and B, which results in the plunger being retracted forcefully. Subsequently, when the charging of C160 is complete, both TR73 and TR63 are deactivated, and the current flows only between A and C, resulting in the plunger being retained. D108 is used for discharging C160, while D109 and D110 are for blocking the relay's counter electromotive force. The time constant involved in the input of TR62 is for preventing the Function Plunger retraction through error.
This is because ALL12V rise earlier than the microcomputer when the power is switched on.

4-2-6. Fast Electronic Sensor (FES) Circuit

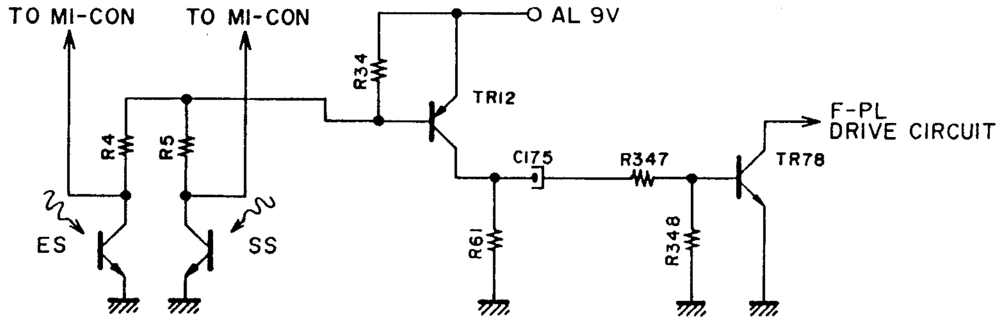


Fig. 5-30

It takes a considerable time before the $\overline{\text{F-PL}}$ cancel signal is sent out with a necessary signal supplied to the microcomputer through activation of the end sensor during fast-forward or the start sensor during rewind operations. This results in the tape being wound past the point where the sensor was activated.

To solve this problem, a signal is required which cancels the $\overline{\text{F-PL}}$ at the same time that the End Sensor (ES) or Start Sensor (SS) is activated. A circuit employed for this purpose is the FES circuit. When the ES or SS operates, the circuit sends the corresponding signal to the microcomputer and activates TR12. This, in turn, causes TR78 to be activated, cancelling the F-PL drive circuit input. However, since C175 is in use, the FES circuit works only momentarily, and the microprocessor's $\overline{\text{F-PL}}$ signal remains cancelled.

4-2-7. Loading Motor Drive Circuit

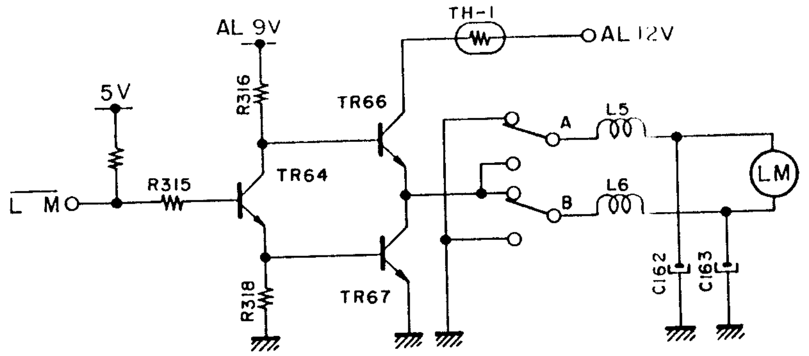


Fig. 5-31

When the Loading Motor signal $\overline{\text{L-M}}$ goes to LOW, TR64 is turned off. Then, the base of TR66 goes to HIGH because of R316, causing the transistor to be activated. On the contrary, TR67 is turned off because its base is at LOW. As a result, ALL12V is applied to point B and the motor rotates. (The motor reverses through actuation of a relay by the Motor Reverse signal $\overline{\text{M-REV}}$.) Then, when $\overline{\text{L-M}}$ is set to "HIGH", TR64 is turned on, which in turn activates TR67 since 0.6V is made available between base and emitter by R316 and R318.
Since a voltage of 0.2 ~ 0.3V is available between collector and emitter of TR64, a potential of about 0.8 to 0.9V appears at the base of TR66.
However, TR66 is Darlington-connected internally with its hfe being 1000 or so, and designed to be activated at 1.2V (between base and emitter), which means that TR66 cannot be activated in this case.
As a result, only TR67 is activated, which applies with a brake to the loading motor. This provision is required to stop the motor quickly so as to avoid excessive rotation of the loading cam; otherwise the cam could get caught, or the idler come off, or the reel brake come on.

4-2-8. Lamp Failure Detection Circuit

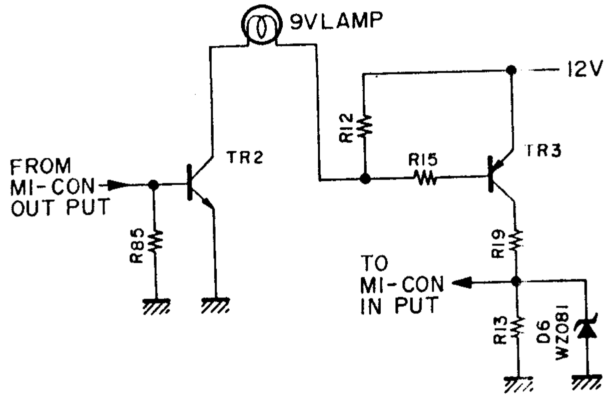


Fig. 5-32

On VP-88, to reduce the power consumed by the "end detection" lamp, the lamp is turned on for about 0.3 second at intervals of 2.3 seconds during the normal mode (except FF, REW, CUE or REVIEW). This arrangement requires that lamp failure be detected only when the lamp is turned on. When TR2 is activated by the microcomputer output, the power is supplied to the lamp from the 12V power source via R12, resulting in the lamp being turned on. In the event of a lamp failure, the base potential of TR3 rises, so TR3 is turned off, and a LOW signal is sent to the microcomputer.

On the other hand, if the lamp is functioning properly, TR3 is activated and a HIGH signal (8.1V) is sent to the microcomputer.
The microcomputer checks on the lamp failure detection data several cycles after the lamp is turned on. The purpose of D6 is to prevent variations in CMOS input voltage since the 12V supply can fluctuate between 10.8V and 14V or so depending on the state of battery change.

4-2-9. Reel Revolution Detection Circuit

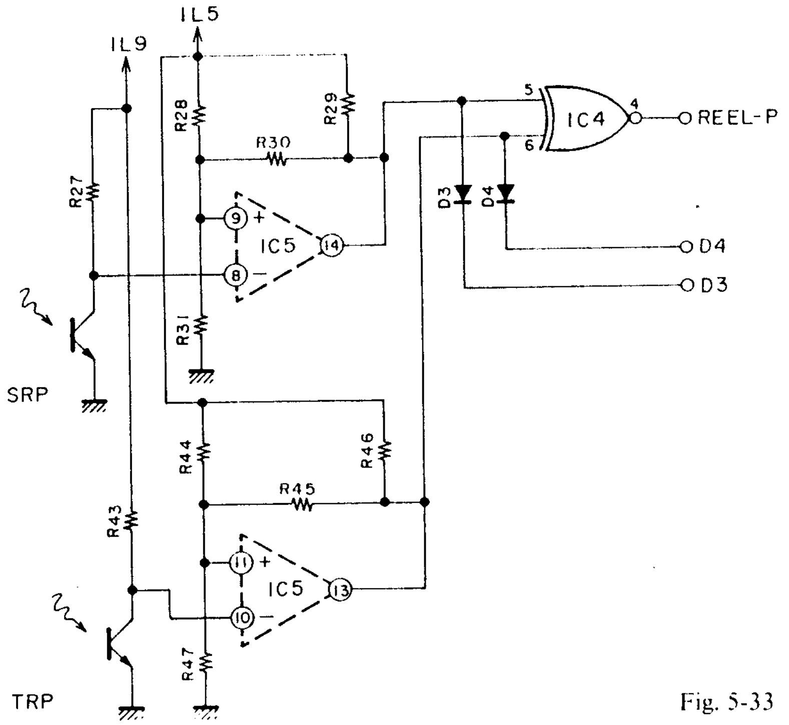


Fig. 5-33

A photo-interrupter is used for reel revolution detection. IC5, R28, R30, R44 and R45 are combined to form a Schmidt circuit, with the threshold voltages being at 5V (high) and 2.9V (low).
Take-up Reel Pulse/Supply Reel Pulse (TRP/SRP) switching is done by means of D3 and D4 which are controlled by the microcomputer. The TRP side is always used for tape counting. During CUE, PLAY or FF operations, the rising edge of the reel pulse is used for counting purposes, while the falling edge is used during REVIEW/REW operations.
For reel stop detection, the TRP side is used during CUE, PLAY or FF operations, or SRP side during REVIEW/REW operations.

4-2-10. Pseudo V-Sync Pulse Generation Circuit

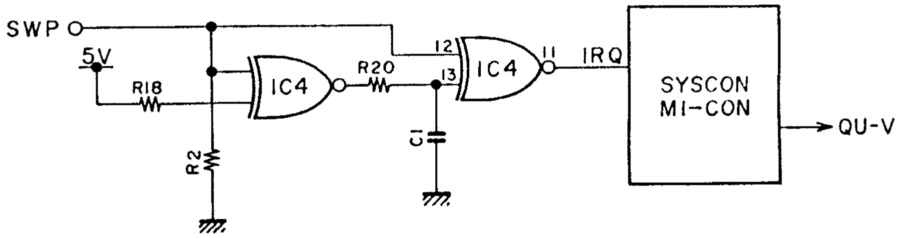


Fig. 5-34

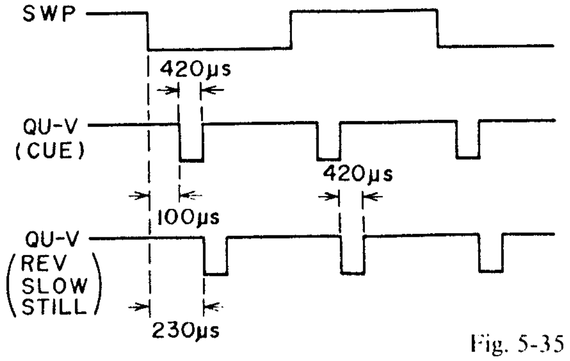


Fig. 5-35

The Syscon microcomputer permits generation, through synchronization with the switching pulse (SWP) edge, of pseudo V-Sync (Qu-V) with a delay of 100μs during FINE-CUE operation or a delay of 230μs during REVIEW, SLOW or STILL operations.
The circuit used for the purpose incorporates exclusive-OR ICs to generate negative-polarity pulses through detection of the rising and falling edges of SWP.

4-2-13. Reel Motor Drive Circuit

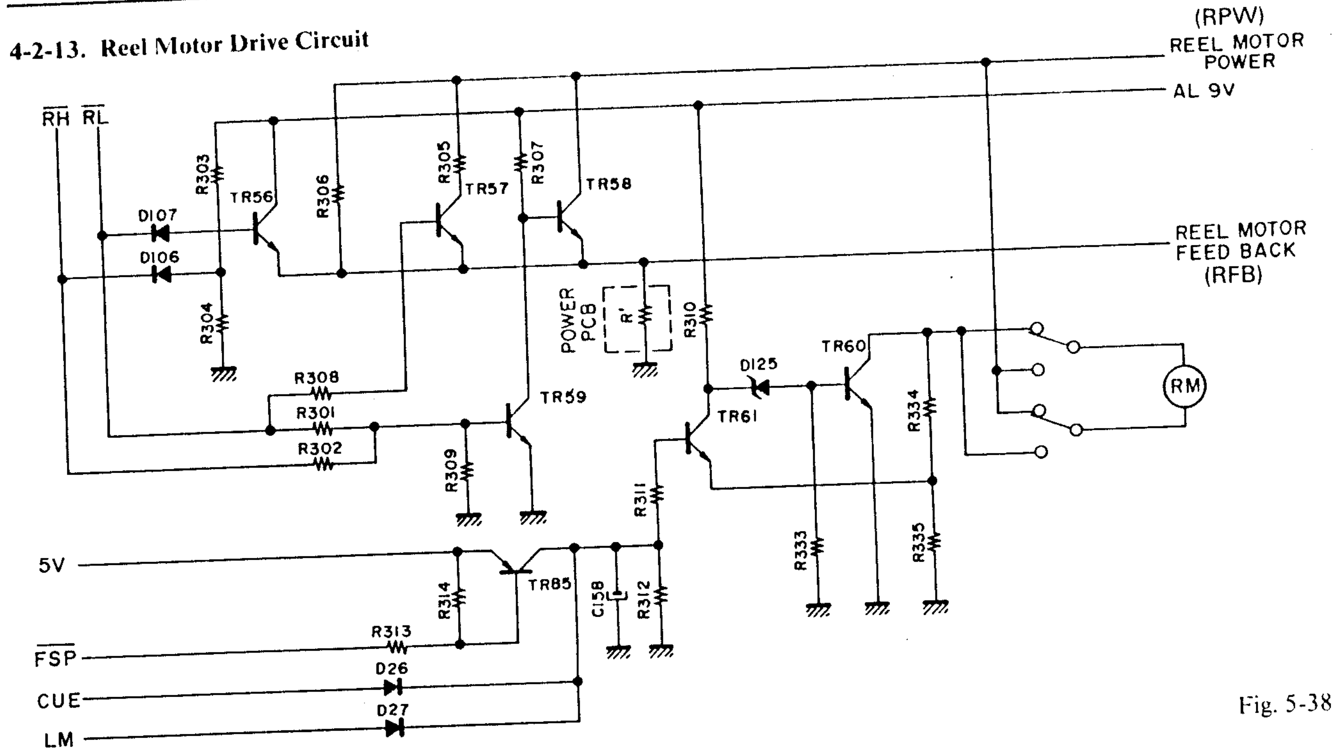


Fig. 5-38

The reel motor power (RPW) is controlled so that the potential of the reel motor feedback (RFB) becomes 3V derived from the switching regulator on the power audio PCB. The RPW potential is changed by means of two control lines Reel High (RH) and Reel Low (RL).
The relationships between mode, control line status and RPW supply potential are shown in the table 5-2 at the right.

MODE / CONT	STOP	FF. REW. CUE UNLOAD	REV	PLAY
$\overline{RH}$	1	1	0	0
$\overline{RL}$	1	0	1	0
RPW	0V	12V	7V	3V

Table 5-2

If both $\overline{RH}$ and $\overline{RL}$ are at "1", TR56 is activated and RFB is forcd to become 3V or more, resulting in zero voltage for the reel motor.
If $\overline{RH}$ is at "1" and $\overline{RL}$ is at "0", RFB is set to 3V or less (i.e., the potential resulting form resistance-division of RPW by R306 and resistance R' on the power audio PCB), and therefore RPW the reel motor drive voltage increases to the full supply voltage.
If $\overline{RH}$ = 0 and $\overline{RL}$ = 1, or $\overline{RH}$ = 0 and $\overline{RL}$ = 0, TR57 or TR58 respectively, is turned on, and RPW is controlled in such a manner that RFB becomes 3V (through the combined resistance of R305, R307 and R306).
TR60 is normally ON. During CUE or UNLOAD operations, TR61 is activated and the cathode potential of the zener diode D125 is reduced, causing TR60 to be deactivated.
Since R334 and R335 are connected in series with the reel motor, the torque is reduced when compared with that obtained during FF or REW operation.

During FINE SLOW operation, RPW supply potential is at 3V, and the reel motor is pulse-driven from the microcomputer by the FINE SLOW pulse (the pulse for step-driving of the capstan motor, or FSP). The potentials and waveforms encountered in the pulse driving are shown below.

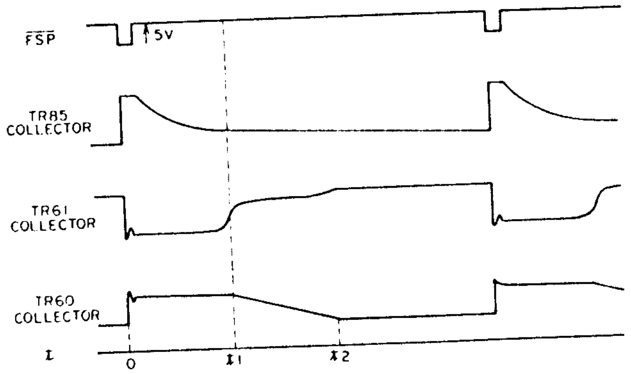


Fig. 5-39

The base potential of TR85 is reduced by $\overline{FSP}$ and C158 is charged by means of a 5V supply.
The base potential of TR61 is then increased, and when TR61 is activated, C158 is discharged for a period of t_1 through R311 and R335. With the lapse of t_1, TR61 enters its working area and the collector potential of TR61 increases to 5V (zener potential) so that it activates TR60.
Then, C158 is discharged through R312, and as the base potential of TR61 decreases, TR60 nearly becomes activated, resulting in reduced TR61 emitter potential. That is, during the period of t_1 to t_2, TR61 and TR60 make up an amplifier circuit, and thus TR60 is gradually activated without its collector potential suddenly going to GND.

4-2-14. Inter-Microcomputer Data Transfer

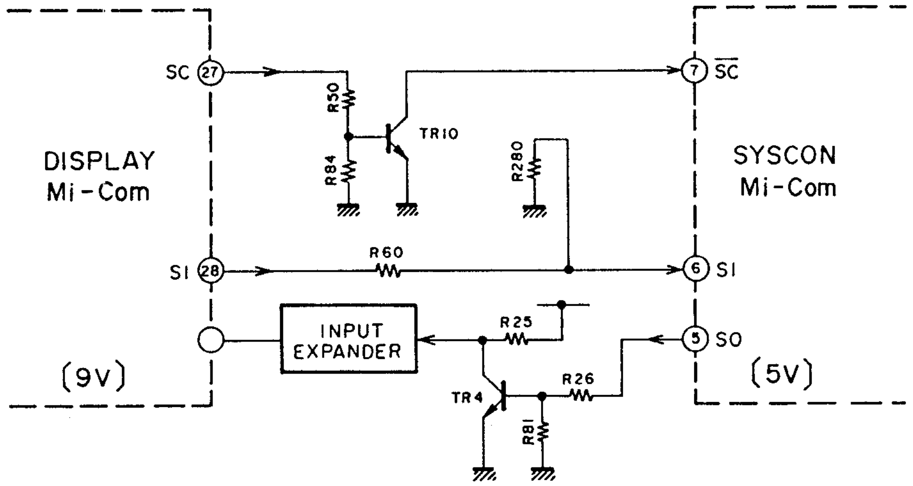

SC 27
SI 28
DISPLAY Mi-Com
(9V)
R50
R84
TR10
R280
R60
INPUT EXPANDER
R25
R26
TR4
R81
7 SC
6 SI
5 SO
SYSCON Mi-Com
(5V)

Fig. 5-40

With VP-88, the serial transfer clock is sent out from the R6 terminal (pin ⑦) of the display microcomputer. In addition, a transistor is used for voltage conversion because of the difference in voltage between the two microcomputers.

The $\overline{SC}$ terminal of the Syscon microcomputer is provided with a pull-up resistance.

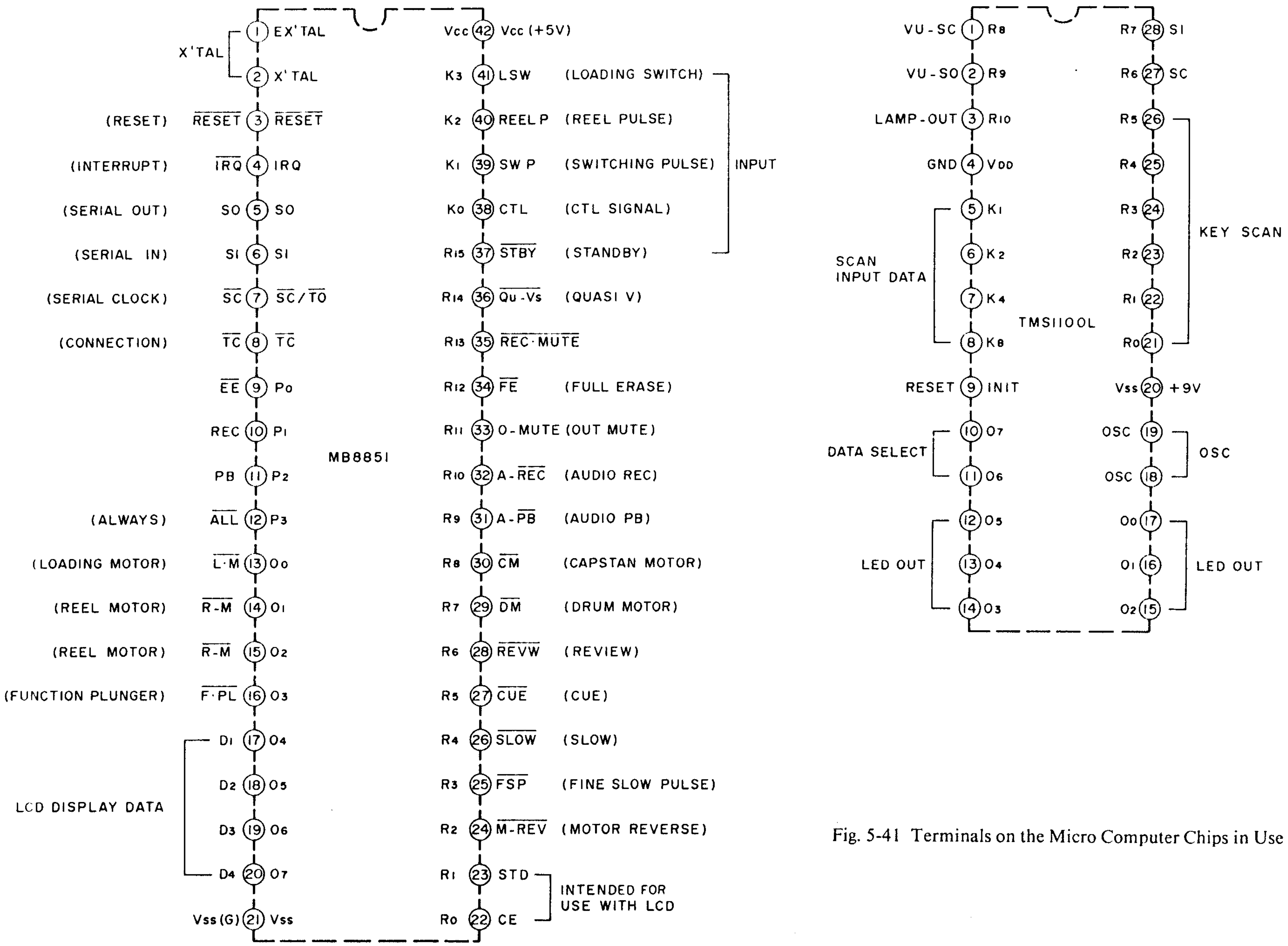
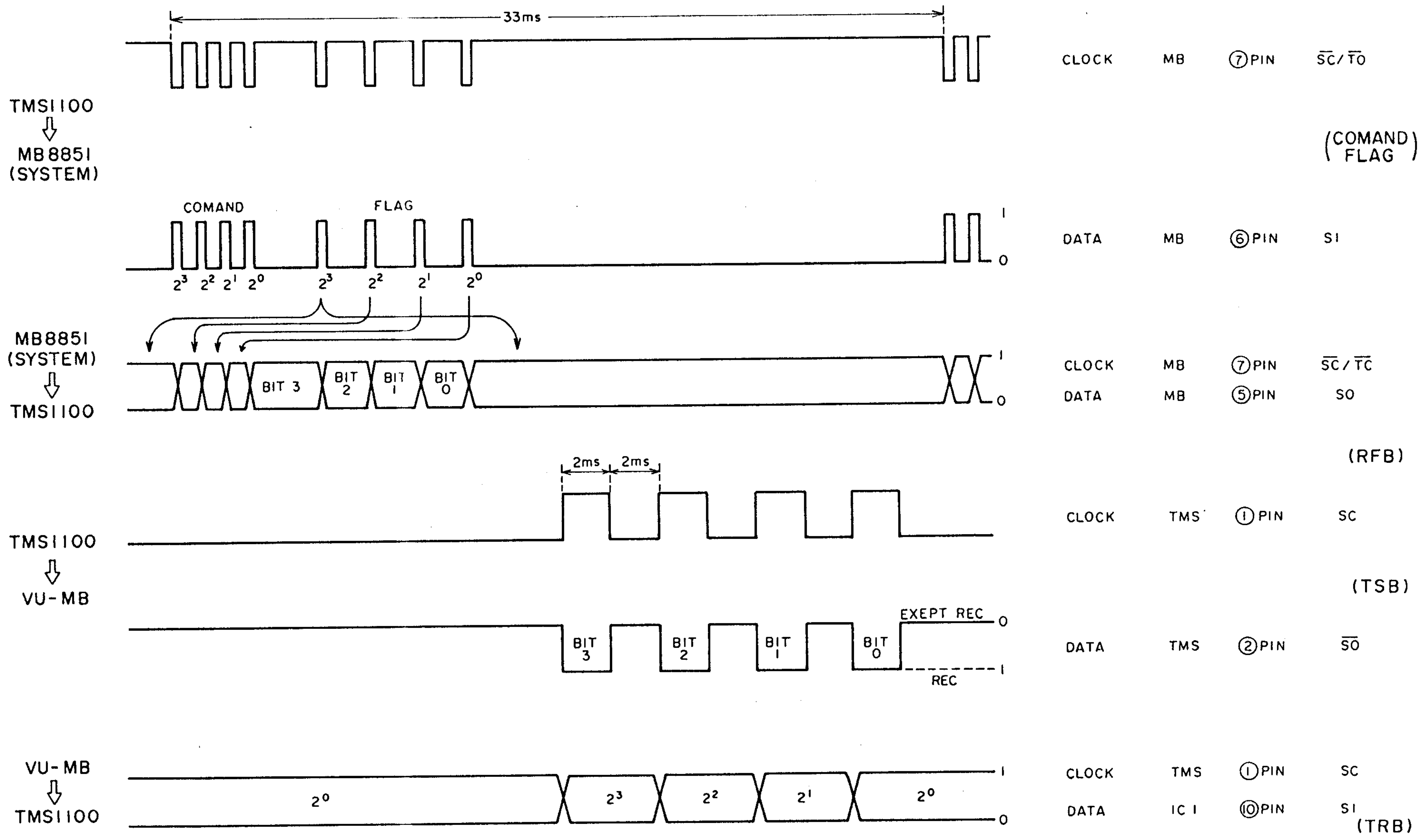

MB8851
X'TAL
1 EX'TAL
2 X'TAL
(RESET) RESET 3 RESET
(INTERRUPT) IRQ 4 IRQ
(SERIAL OUT) SO 5 SO
(SERIAL IN) SI 6 SI
(SERIAL CLOCK) SC 7 SC/TO
(CONNECTION) TC 8 TC
EE 9 P0
REC 10 P1
PB 11 P2
(ALWAYS) ALL 12 P3
(LOADING MOTOR) L·M 13 O0
(REEL MOTOR) R-M 14 O1
(REEL MOTOR) R-M 15 O2
(FUNCTION PLUNGER) F·PL 16 O3
LCD DISPLAY DATA
D1 17 O4
D2 18 O5
D3 19 O6
D4 20 O7
Vss(G) 21 Vss
Vcc 42 Vcc (+5V)
K3 41 LSW (LOADING SWITCH)
K2 40 REEL P (REEL PULSE)
K1 39 SW P (SWITCHING PULSE)
K0 38 CTL (CTL SIGNAL)
R15 37 STBY (STANDBY)
INPUT
R14 36 Qu-Vs (QUASI V)
R13 35 REC·MUTE
R12 34 FE (FULL ERASE)
R11 33 O-MUTE (OUT MUTE)
R10 32 A-REC (AUDIO REC)
R9 31 A-PB (AUDIO PB)
R8 30 CM (CAPSTAN MOTOR)
R7 29 DM (DRUM MOTOR)
R6 28 REVW (REVIEW)
R5 27 CUE (CUE)
R4 26 SLOW (SLOW)
R3 25 FSP (FINE SLOW PULSE)
R2 24 M-REV (MOTOR REVERSE)
R1 23 STD
R0 22 CE
INTENDED FOR USE WITH LCD
TMS1100L
VU-SC 1 R8
VU-SO 2 R9
LAMP-OUT 3 R10
GND 4 VDD
SCAN INPUT DATA
5 K1
6 K2
7 K4
8 K8
RESET 9 INIT
DATA SELECT
10 O7
11 O6
LED OUT
12 O5
13 O4
14 O3
R7 28 SI
R6 27 SC
R5 26
R4 25
R3 24
R2 23
R1 22
R0 21
KEY SCAN
Vss 20 +9V
OSC 19
OSC 18
OSC
O0 17
O1 16
O2 15
LED OUT

Fig. 5-41 Terminals on the Micro Computer Chips in Use

Data Transfer


33ms
TMS1100 ⇩ MB8851 (SYSTEM)
CLOCK MB ⑦PIN SC/TO
(COMAND FLAG)
COMAND
FLAG
2^3 2^2 2^1 2^0 2^3 2^2 2^1 2^0
1
0
DATA MB ⑥PIN SI
MB8851 (SYSTEM) ⇩ TMS1100
BIT 3
BIT 2
BIT 1
BIT 0
CLOCK MB ⑦PIN SC/TC
DATA MB ⑤PIN SO
(RFB)
2ms
2ms
TMS1100 ⇩ VU-MB
CLOCK TMS ①PIN SC
(TSB)
EXEPT REC
REC
DATA TMS ②PIN SO
VU-MB ⇩ TMS1100
2^0
2^3
2^2
2^1
2^0
CLOCK TMS ①PIN SC
DATA IC1 ⑩PIN SI
(TRB)

(NOTE : No data transfer between SYSCON Mi-COM and VU Mi-COM)

Fig. 5-42 Data Transfer

DATA / ADDRRS	COMMAND	FLAG	TRB
φ	NO - CMD	NO - FLG	NO - CONECT
1	STOP	MEMORY	CUE
2	FF	BAT 3	DOWN
3	REW	DEW ON	STOP
4	PLAY - STILL	BAT 1	POFF
5	PAUSE	INSERT	REC
6	SDUB - STILL	TEST ON	PAUSE or STILL
7	PLAY	SLOW UP	FF
8	REC	BAT φ	NO - CMD
9	SDUB	REPEAT	PLAY
A	CUE	BAT 4	UP
B	REVW	DEW OFF	REW
C	SLOW	BAT 2	SLOW
D	CANCEL	RST	SDUB
E	SEARCH	TEST OFF	REVW
F	POFF	SLOW DOWN	RST
	(TMS → MB)	(TMS → MB)	(TMS ← VU-88)

DATA / BIT	RFB	TSB
3	REPEAT*5	POWER
2	STOP*1	TMEN*2
1	POWER	CHEN*3
0	EMERG*4	EMERG

*1 This applies where STOP is issued independently by MB (Syscon) because of trouble caused by Syscon. (REEL STOP, SWP STOP, REPEAT operation)

*2 Timer enable

*3 Channel enable

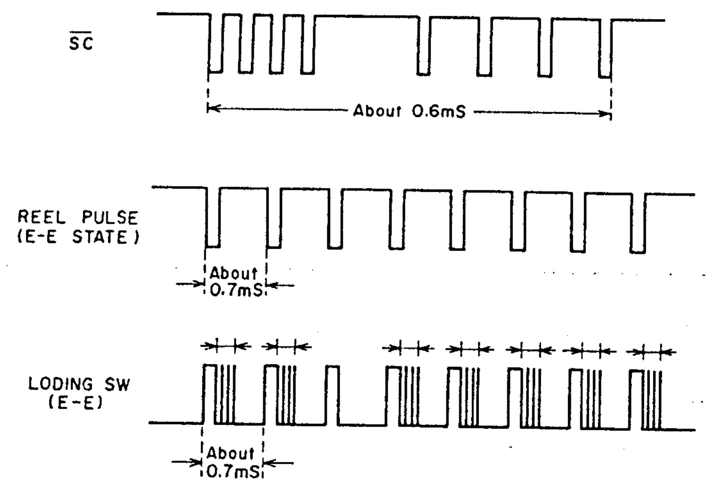
*4 If the loading switch state is abnormal, loading error is assumed and POWER OFF results with EMERGENCY established.

*5 This REPEAT is "1" during repeat operation.

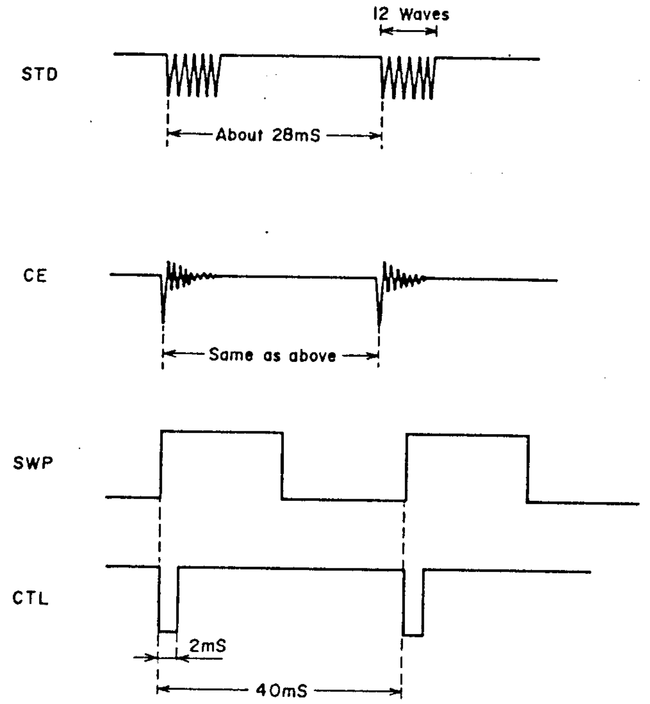
Table 5-3 Data Transfer

Pulses during Normal Operations

Pulses generated during normal operations.


SC
About 0.6mS
REEL PULSE (E-E STATE)
About 0.7mS
LODING SW (E-E)
About 0.7mS

Loading SW – inverse and similarity


12 Waves
STD
About 28mS
CE
Same as above
SWP
CTL
2mS
40mS

IC TMS 1100L input scan pulse examples (EJECT state)

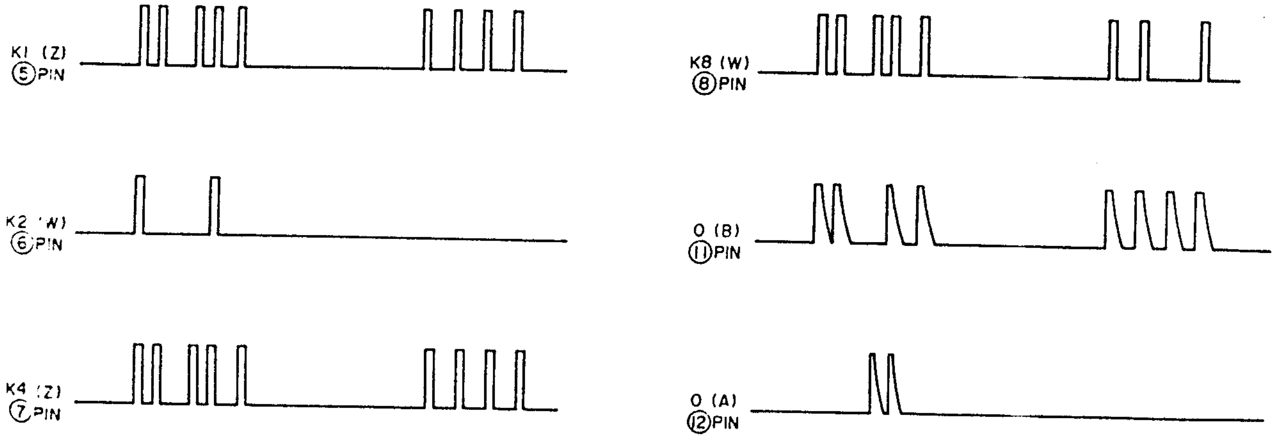

K1 (Z) ⑤PIN
K2 (W) ⑥PIN
K4 (Z) ⑦PIN
K8 (W) ⑧PIN
O (B) ⑪PIN
O (A) ⑫PIN

Fig. 5-43 Pulses during Normal Operations

5. SERVO CIRCUITRY

In common with every VTR, VP-88 employs a servo system to keep both the drum and capstan motors in phase with a reference input voltage (REF V).

Fig. 5-44 shows the block diagram of the servo system employed on VP-88, which can be said to be essentially made up of a basic servo loop consisting of IC-3 and IC-10.

Fig. 5-45 shows the basic servo loop.

Table 5-4 gives the reference input signals for the drum and capstan motor servo phase control in conjunction with each mode selected.

MODE	SERVO REFERENCE	DRUM PHASE COMPARISON	CAPSTAN PHASE COMPARISON
REC	V sync from V.I	PG from D.M	FG. from C.M
NOR P.B	V pulse from X.TAL	PG from D.M	CTL
CUE	OSC 150 Hz	PG from D.M	CTL × 1/3
REW	OSC 150 Hz	PG from D.M	CTL × 1/3
SLOW	V pulse from X.TAL	PG × α	CTL
STILL	V pulse from X.TAL	PG × α	
REC CANCEL	OSC 150 Hz	PG from D.M	CTL
NTSC P.B	NTSC sync 60 Hz	PG + β	CTL

Table 5-4

Notes:

1) α (V) is applied to either of the Phax Generator (PG) delay MMs in IC3 to change the pulse width by 1.5H. As a result, the switching pulse duty ratio changes by 1.5H, there ensuring smooth SLOW/STILL operation.
2) β (V) is applied to both of the PG delay MMs in IC3 to change the pulse width. The switching point is also selected for 6.5H during NTSC PB operation.

r the drum
onjunction

ASE
ON
M

Table 5-4

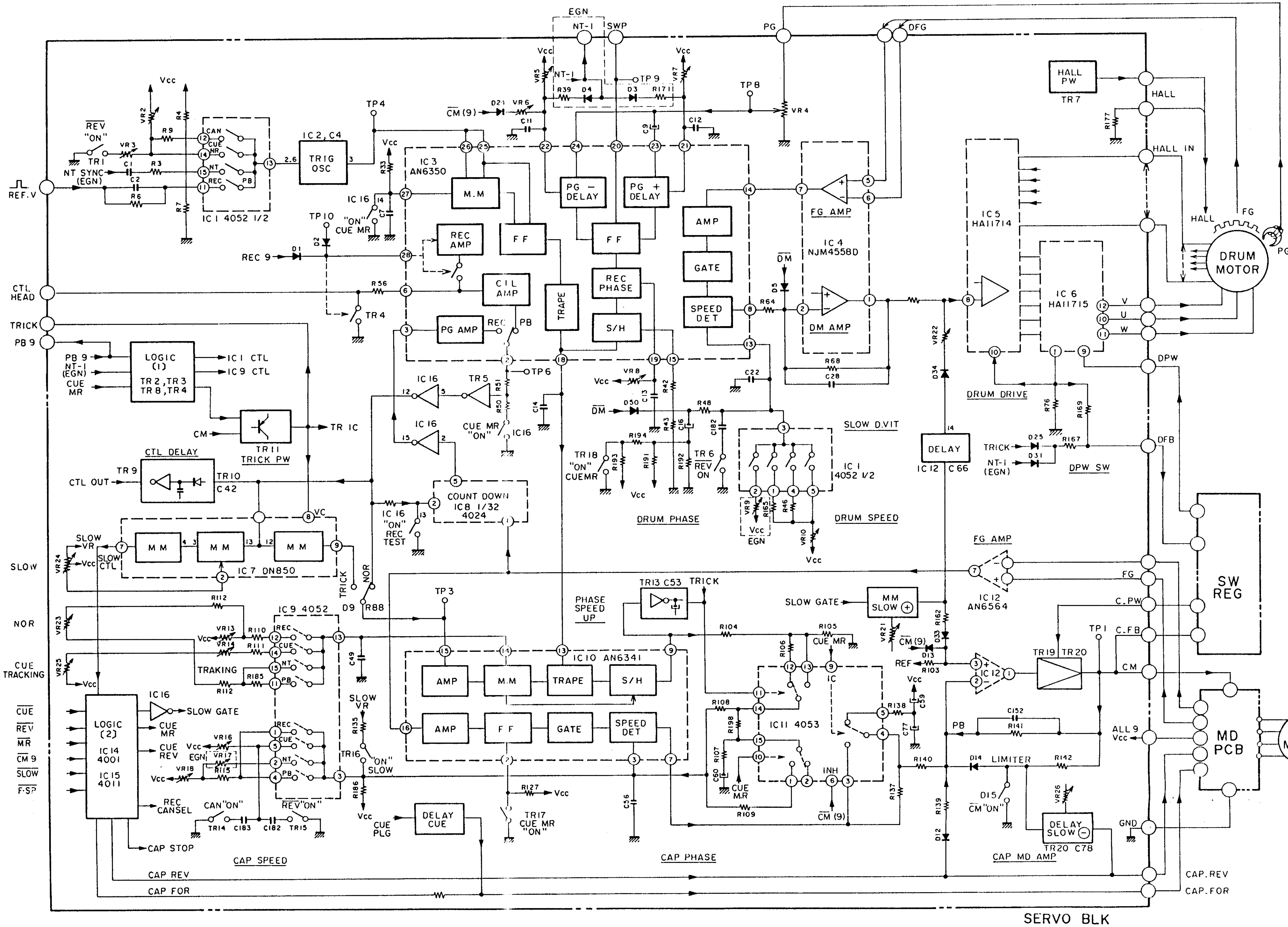
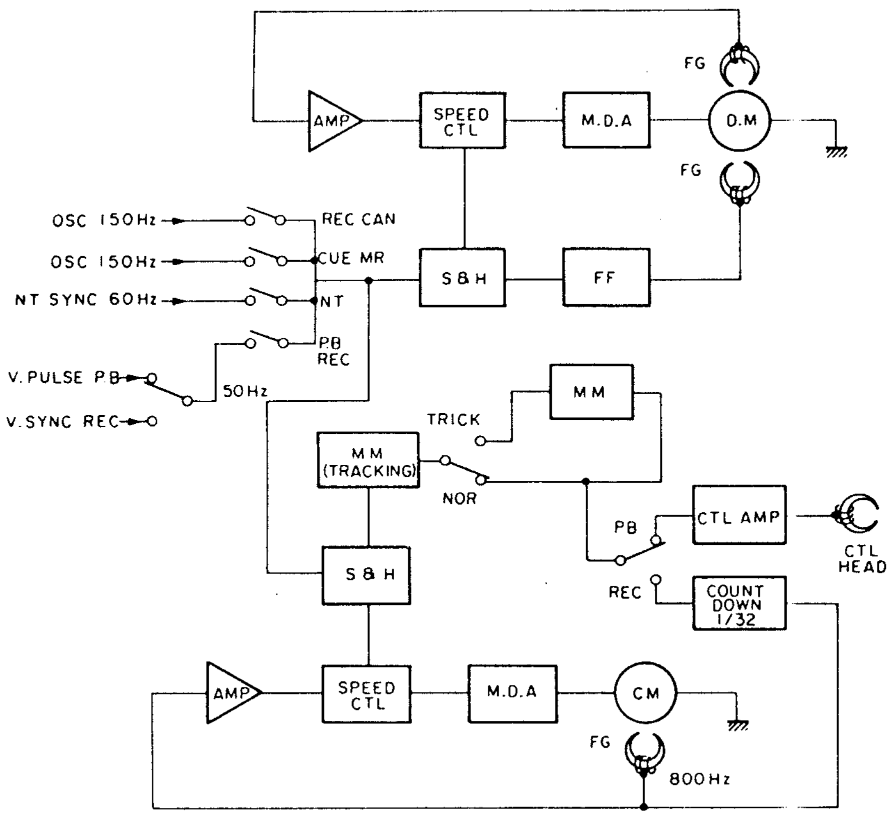

EGN
NT-1
SWP
PG
DFG
Vcc
VR5
VR7
TP9
R39
D4
D3
R171
TP8
VR4
D21
VR6
CM (9)
C11
C9
C12
TP4
REV "ON"
VR2
R4
R9
VR3
TR1
NT SYNC (EGN)
C1
R3
C2
R6
R7
REF.V
CAN
CUE MR
NT
REC
PB
IC1 4052 1/2
IC2, C4
TRIG OSC
IC3 AN6350
R33
M.M
IC16
"ON" CUE MR
C7
TP10
D2
D1
REC 9
REC AMP
FF
PG − DELAY
PG + DELAY
FF
REC PHASE
S/H
TRAPE
AMP
GATE
SPEED DET
FG AMP
IC4 NJM4558D
DM
D5
R64
DM AMP
R68
C28
HALL PW
TR7
HALL
R177
HALL IN
IC5 HA11714
IC6 HA11715
DRUM MOTOR
FG
V
U
W
DPW
DRUM DRIVE
R76
R169
VR22
D34
DELAY
IC12 C66
TRICK
D25
R167
NT-1 (EGN)
D31
DPW SW
DFB
CTL HEAD
R56
CTL AMP
TR4
TRICK
PB 9
PG AMP
REC
TP6
TR5
R51
R50
CUE MR "ON"
C14
PB 9
NT-1 (EGN)
CUE MR
LOGIC (1)
TR2, TR3
TR8, TR4
IC1 CTL
IC9 CTL
CM
TR11 TRICK PW
TR IC
CTL DELAY
TR9
CTL OUT
TR10
C42
VR8
R42
C13
C22
DM
D30
R48
C182
R43
C16
R194
TR18 "ON" CUEMR
R193
R191
R192
TR6 REV ON
SLOW D.VIT
IC1 4052 1/2
VR9
R165
R46
EGN
VR10
DRUM PHASE
DRUM SPEED
COUNT DOWN IC8 1/32 4024
IC16 "ON" REC TEST
SLOW VR
VR24
SLOW CTL
MM
IC7 DN850
VC
SLOW
NOR
TRICK
R112
VR23
IC9 4052
D9
R88
VR13
R110
VR14
R111
TRAKING
R185
CUE TRACKING
VR25
C49
TP3
PHASE SPEED UP
IC10 AN6341
AMP
M.M
TRAPE
S/H
FF
GATE
SPEED DET
TR13 C53
SLOW GATE
MM SLOW (+)
VR21
R162
CM (9)
D33
D13
REF
R103
IC12
FG AMP
IC12 AN6564
C.PW
TP1
C.FB
TR19 TR20
SW REG
R104
R105
CUE MR
R106
IC
R108
R198
IC11 4053
R107
C60
CUE M.R
R109
INH
CM (9)
R138
C59
C77
R137
R140
R139
D12
PB
C152
R141
ALL 9 Vcc
D14
LIMITER
R142
D15
CM "ON"
VR26
DELAY SLOW (−)
TR20 C78
CAP MD AMP
GND
MD PCB
CAP MOTOR
CUE
REV
MR
CM 9
SLOW
F·SP
LOGIC (2)
IC14 4001
IC15 4011
SLOW GATE
CUE MR
CUE REV
EGN
VR16
VR17
VR18
R115
REC CANSEL
CAN "ON"
TR14
C183
C182
TR15
REV "ON"
SLOW VR
R135
TR16 "ON" SLOW
R186
CUE PLG
DELAY CUE
R127
TR17 CUE MR "ON"
C56
CAP STOP
CAP SPEED
CAP PHASE
CAP REV
CAP FOR
CAP.REV
CAP.FOR
SERVO BLK

Fig. 5-44 Servo Block Diagram

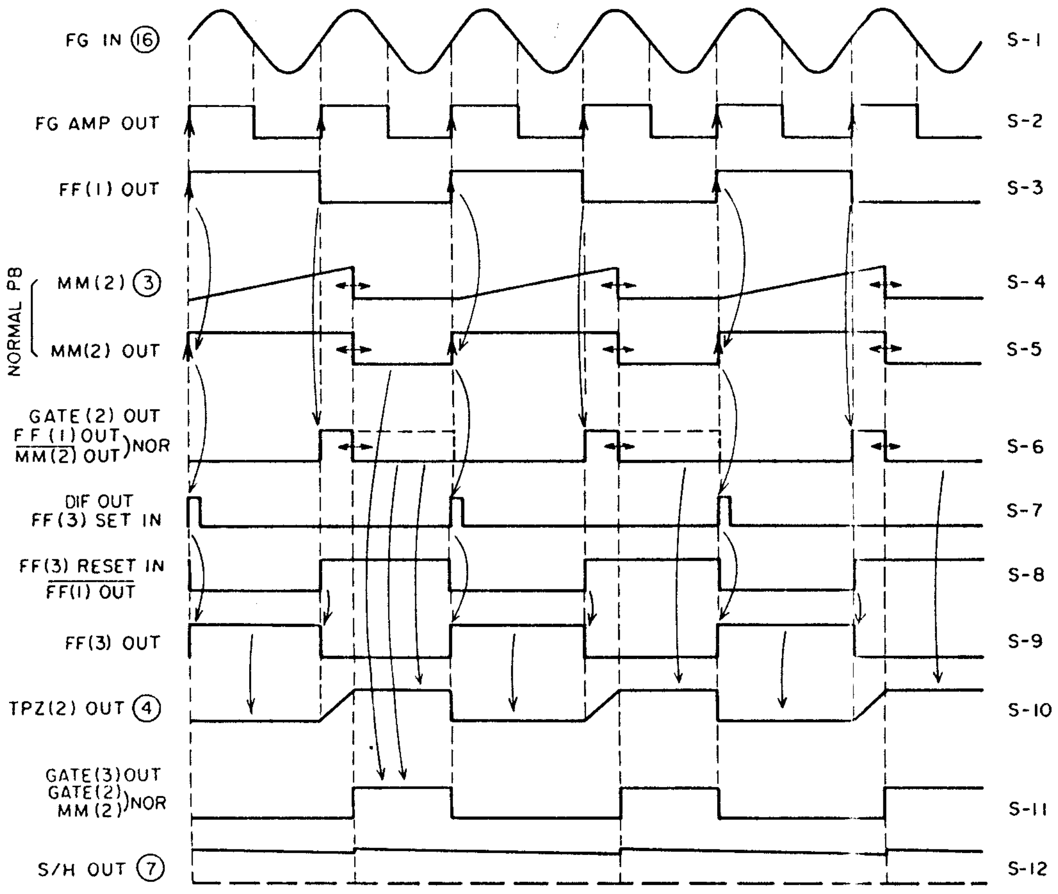
)



FG
AMP
SPEED CTL
M.D.A
D.M
FG
OSC 150Hz
REC CAN
OSC 150Hz
CUE MR
NT SYNC 60Hz
NT
S&H
FF
PB REC
V.PULSE PB
50Hz
V.SYNC REC
MM
TRICK
MM (TRACKING)
NOR
PB
CTL AMP
CTL HEAD
S&H
REC
COUNT DOWN 1/32
AMP
SPEED CTL
M.D.A
CM
FG
800Hz

Fig. 5-45 Basic SERVO LOOP

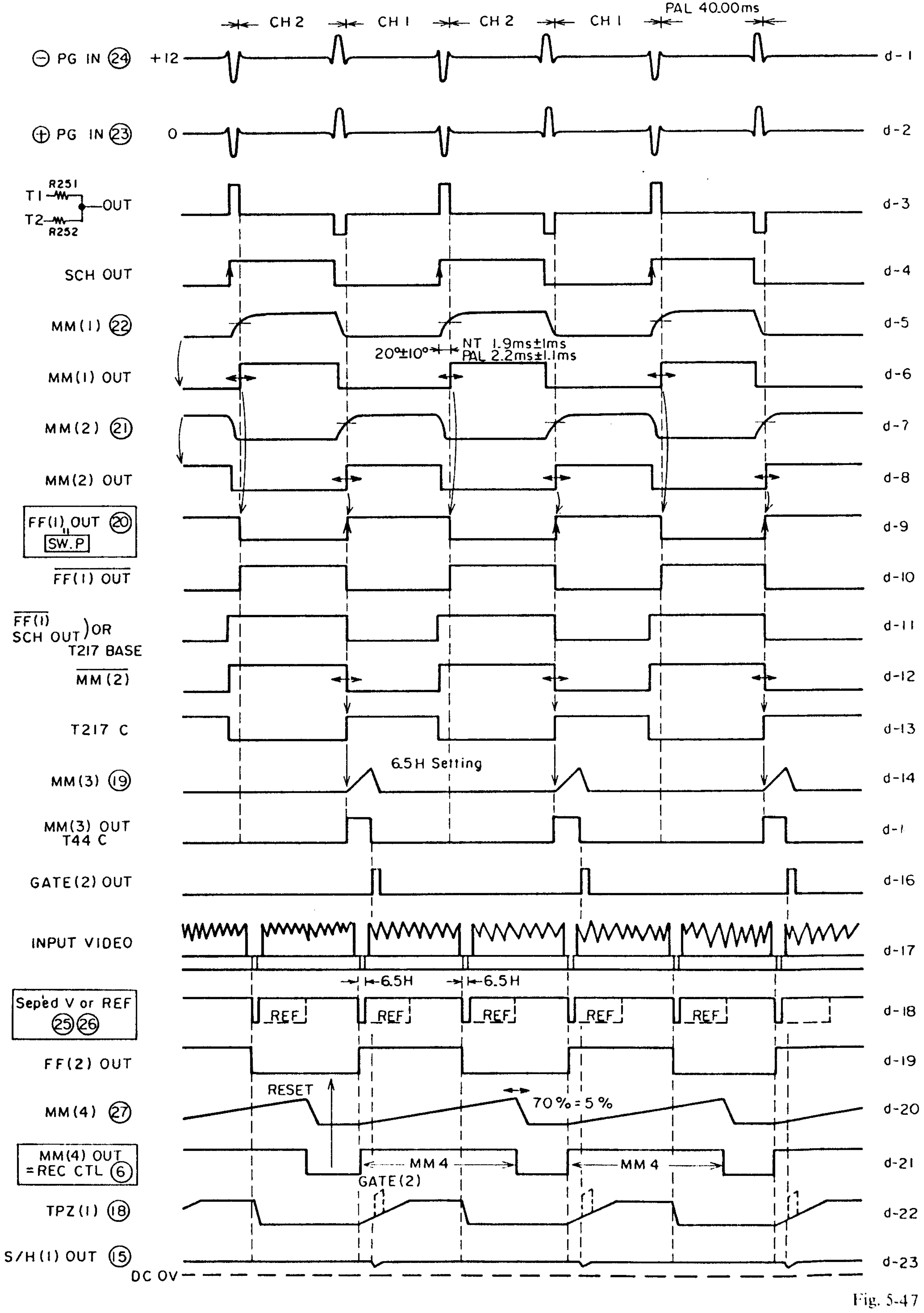
AN6350 SPEED CONTROL



FG IN ⑯
FG AMP OUT
FF(1) OUT
NORMAL PB
MM(2) ③
MM(2) OUT
GATE(2) OUT
FF(1)OUT
MM(2) OUT)NOR
DIF OUT
FF(3) SET IN
FF(3) RESET IN
FF(1) OUT
FF(3) OUT
TPZ(2) OUT ④
GATE(3)OUT
GATE(2)
MM(2))NOR
S/H OUT ⑦
S-1
S-2
S-3
S-4
S-5
S-6
S-7
S-8
S-9
S-10
S-11
S-12

Fig. 5-46

AN6350 DRUM MOTOR PHASE CONTROL



NTSC 33.33ms
PAL 40.00ms
CH 2
CH 1
CH 2
CH 1
⊖ PG IN ㉔
+12
⊕ PG IN ㉓
0
R251
T1
T2
R252
OUT
SCH OUT
MM(1) ㉒
20°±10°
NT 1.9ms±1ms
PAL 2.2ms±1.1ms
MM(1) OUT
MM(2) ㉑
MM(2) OUT
FF(1) OUT ⑳
SW.P
FF(1) OUT
FF(1)
SCH OUT)OR
T217 BASE
MM(2)
T217 C
6.5H Setting
MM(3) ⑲
MM(3) OUT
T44 C
GATE(2) OUT
INPUT VIDEO
6.5H
6.5H
Sep'ed V or REF ㉕㉖
REF
FF(2) OUT
RESET
70%±5%
MM(4) ㉗
MM(4) OUT
=REC CTL ⑥
MM 4
MM 4
GATE(2)
TPZ(1) ⑱
S/H(1) OUT ⑮
DC 0V
d-1
d-2
d-3
d-4
d-5
d-6
d-7
d-8
d-9
d-10
d-11
d-12
d-13
d-14
d-1
d-16
d-17
d-18
d-19
d-20
d-21
d-22
d-23

Fig. 5-47

-1
-2
-3
1-4
1-5
1-6
1-7
d-8
d-9
d-10
d-11
d-12
d-13
d-14
d-15
d-16
d-17
d-18
d-19
d-20
d-21
d-22
d-23
g. 5-47

AN6341N CAPSTAN MOTOR SPEED CONTROL

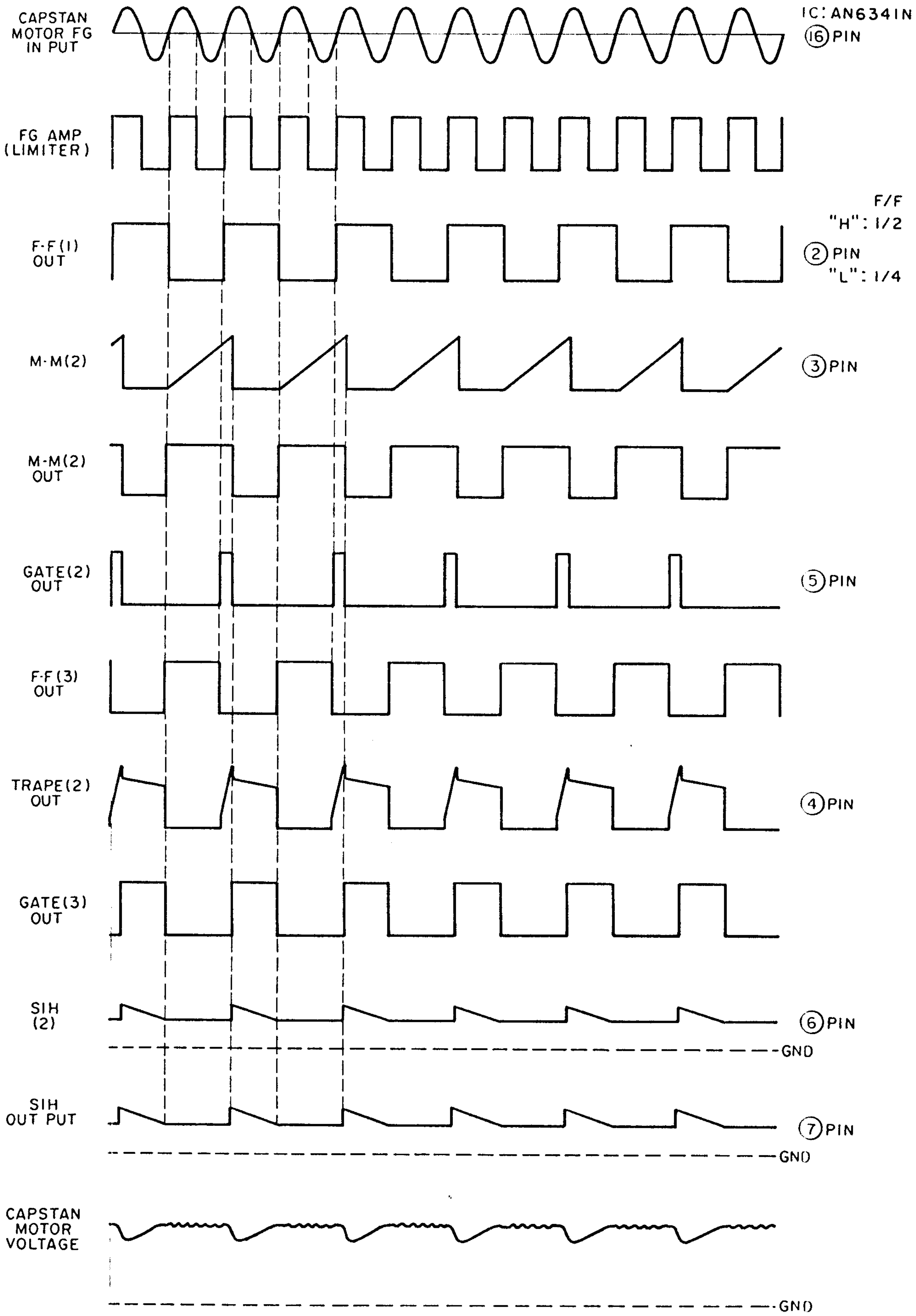

CAPSTAN MOTOR FG IN PUT
IC: AN6341N
⑯PIN
FG AMP (LIMITER)
F/F
"H": 1/2
F·F(1) OUT
②PIN
"L": 1/4
M·M(2)
③PIN
M·M(2) OUT
GATE(2) OUT
⑤PIN
F·F(3) OUT
TRAPE(2) OUT
④PIN
GATE(3) OUT
S/H (2)
⑥PIN
GND
S/H OUT PUT
⑦PIN
GND
CAPSTAN MOTOR VOLTAGE
GND

Fig. 5-48

AN6341N CAPSTAN MOTOR PHASE CONTROL

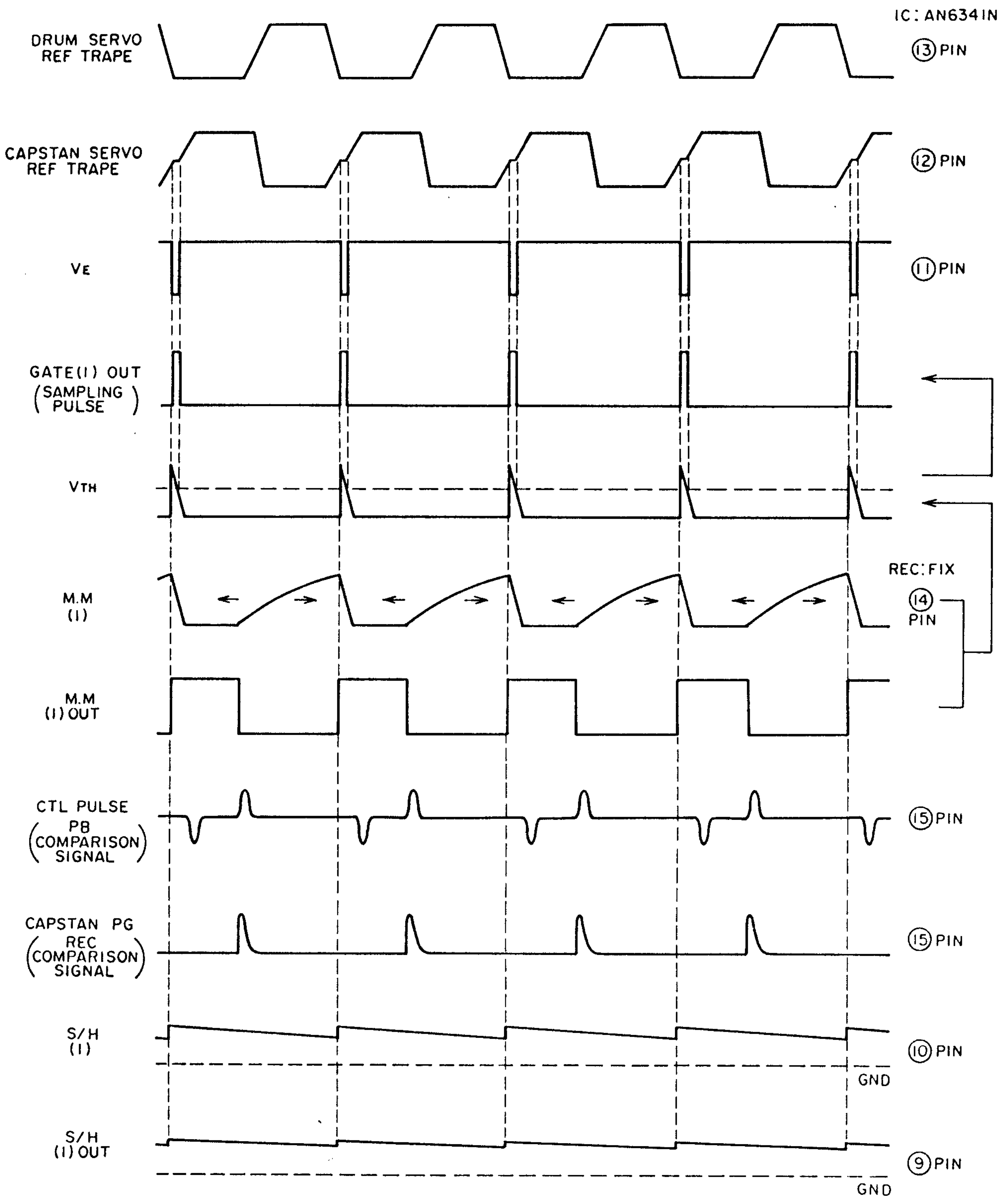

IC: AN6341N
DRUM SERVO REF TRAPE
⑬PIN
CAPSTAN SERVO REF TRAPE
⑫PIN
VE
⑪PIN
GATE(1) OUT (SAMPLING PULSE)
VTH
REC: FIX
M.M (1)
⑭PIN
M.M (1) OUT
CTL PULSE (PB COMPARISON SIGNAL)
⑮PIN
CAPSTAN PG (REC COMPARISON SIGNAL)
⑮PIN
S/H (1)
⑩PIN
GND
S/H (1) OUT
⑨PIN
GND

Fig. 5-49

5-1. DRUM SERVO DESCRIPTION

5-1-1. Reference V Pulse (REF V) Oscillator Circuit

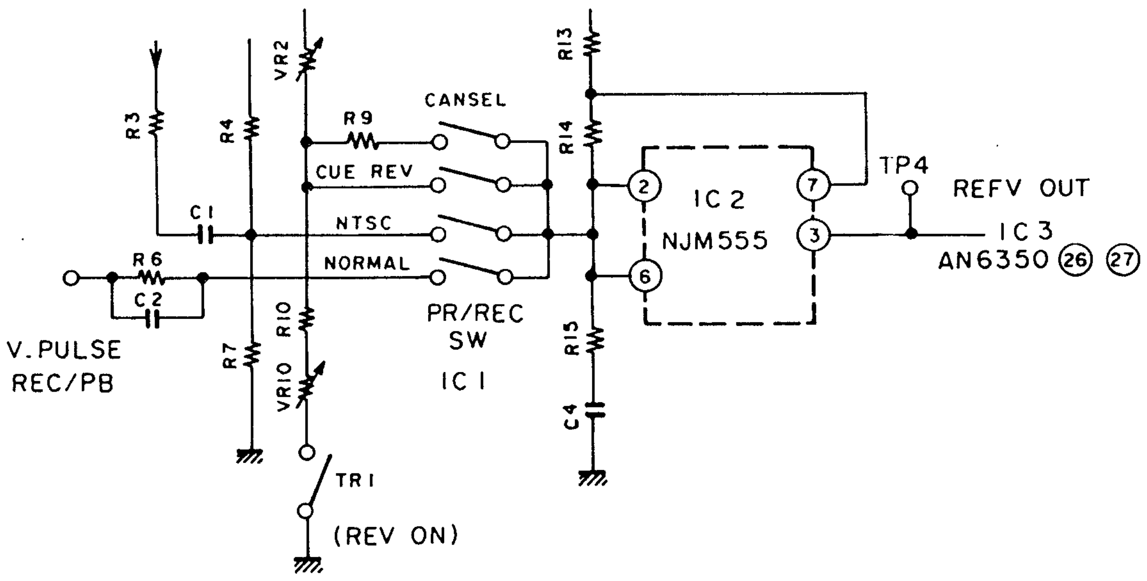
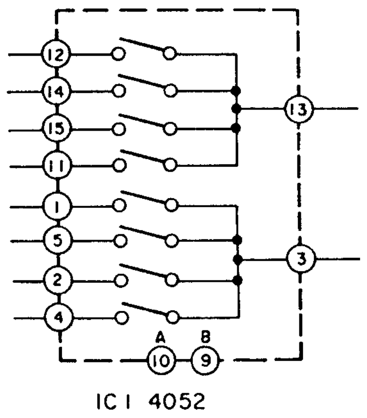

R3
R4
VR2
R9
CANSEL
R13
R14
CUE REV
NTSC
NORMAL
C1
R6
C2
V.PULSE
REC/PB
R7
R10
VR10
PR/REC
SW
IC1
R15
C4
TR1
(REV ON)
IC2
NJM555
2
7
3
6
TP4
REFV OUT
IC3
AN6350 ㉖ ㉗

Fig. 5-50(a)

The drum servo provides phase lock by using REF V as a reference signal, so as to ensure stabilized motor revolution.

The reference signal is generated by a circuit shown in Fig. 5-50(a). This circuit consists of mode switches and an oscillation circuit.


12
14
15
11
1
5
2
4
13
3
A
B
10
9
IC1 4052

MODE	INPUT SIGNAL A	B	CONNECTION
1. PB. REC	1	1	⑪—⑬ ④—③
2. CUE	1	0	⑭—⑬ ⑤—③
3. REV	1	0	⑭—⑬ ⑤—③
4. CANCEL	0	0	⑫—⑬ ①—③
5. NTSC	0	1	⑮—⑬ ②—③

Fig. 5-50(b)

Operation in each mode

1) Normal REC/PB mode

   The circuit, which is coupled with switch (IC1), serves as an unstable multivibrator (constants involved are those of R13, R14, R15, R6 and C4).

   R15 serves as a potential dividing resistance for V PULSE, and C2 and R15 form a differentiation circuit so as to provide the function of a trigger oscillator. The free oscillation frequency is about 45 Hz. Synchronization takes place when V PULSE (50 Hz) is supplied.

2) NTSC mode

   With the EGN version a 60-Hz pulse is supplied from C1 with reference to the time constants of R4, R7 R13, R14, R15 and C4.

3) CUE, REVIEW or REC CANCEL modes

   With these modes, no input signal is supplied.

   The reference signal is generated by the oscillator using a fixed time constant only.

   SW MODE switching (IC1) is made through logic CTL as shown in Fig. 5-50(b).

5-1-2. Drum Motor Speed Switching and Phase Compensation Circuit

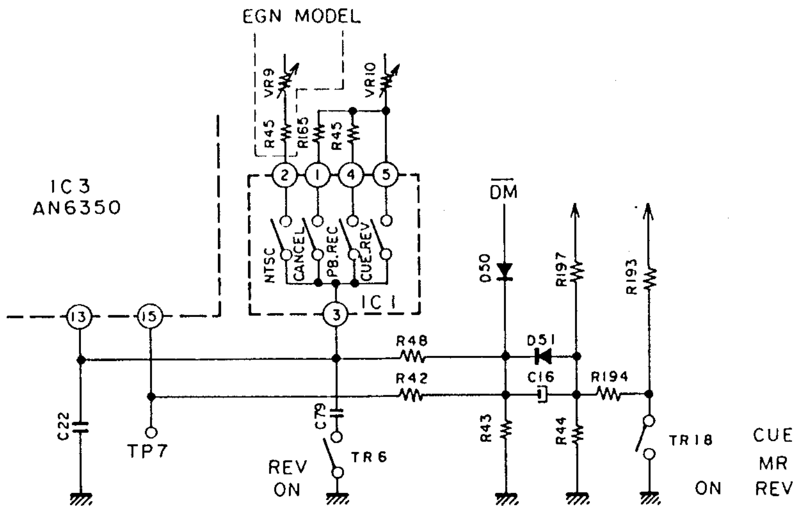

EGN MODEL
VR9
VR10
R45
R165
R45
IC3
AN6350
2
1
4
5
NTSC
CANCEL
PB.REC
CUE.REV
IC1
3
13
15
DM
D50
R197
R193
R48
D51
R42
C16
R194
C22
TP7
C79
REV
ON
TR6
R43
R44
TR18
ON
CUE
MR
REV

Fig. 5-51

1) Speed switching (For SW modes, see Fig. 5-50(b))

   The drum speed varies according to C22 and the value of the resistor R connected to each switch (SW) in IC1. In the "phase lock" condition, variation in this time constant results in variation in the PHASE DET voltage.

2) Phase compensation

   Before the PHASE DET voltage appearing at pin ⑤ of IC3 can be applied to the speed system, it must have its phase corrected and have the correct gain.

   R42, R43, C16 and R44 are for phase correction, while R48 is primarily for obtaining the correct gain.

   Other diodes and resistors are used to provide for charging of C16, voltage shift, discharging, etc., so as to ensure quick response.

   ⓐ R197 (R193 + R194): to cause a voltage drop of 1.8V across R44 when the power is turned on.

   ⓑ TR18 and R194: to cause a voltage change across R44 during CUE, REVIEW or MOTOR REVERSE operation.

   ⓒ D50: to permit supplementary charging at drum motor stop time.

   ⓓ D51: to serve as a limiter.

5-1-3. REC CTL/Mono-stable Multivibrator (MM) Switching

The M.M. (㉗ of IC-3: AN6350) not only acts as a V. PULSE frequency dividing gate, but also is used as the REC. CTL signal. However, during CUE, REVIEW or REC CANCEL operations, the V. PULSE repetition rate becomes 150 Hz (three times the original value) and thus the gate causes the malfunction of the frequency-dividing flip-flop (F.F.).

To avoid this, IC16 is turned on so that the action of the M.M. is stopped.

5-1-4. SLOW STILL/Quasi-V. SYNC Switching

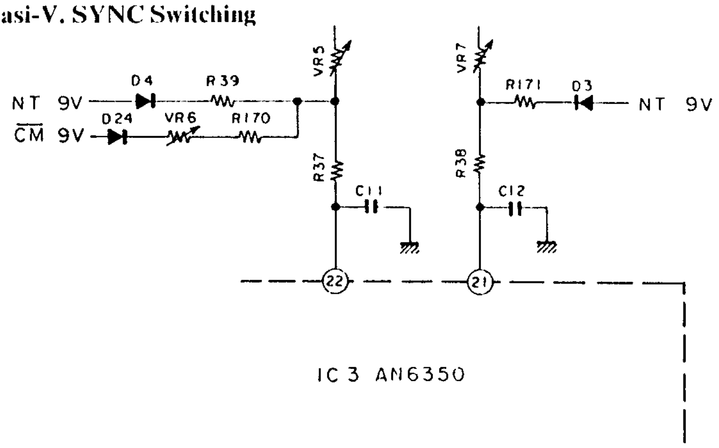

VR5
VR7
D4
R39
NT 9V
D24
VR6
R170
CM 9V
R171
D3
NT 9V
R37
C11
R38
C12
22
21
IC3 AN6350

Fig. 5-52

5-1-2. Drum Motor Speed Switching and Phase Compensation Circuit

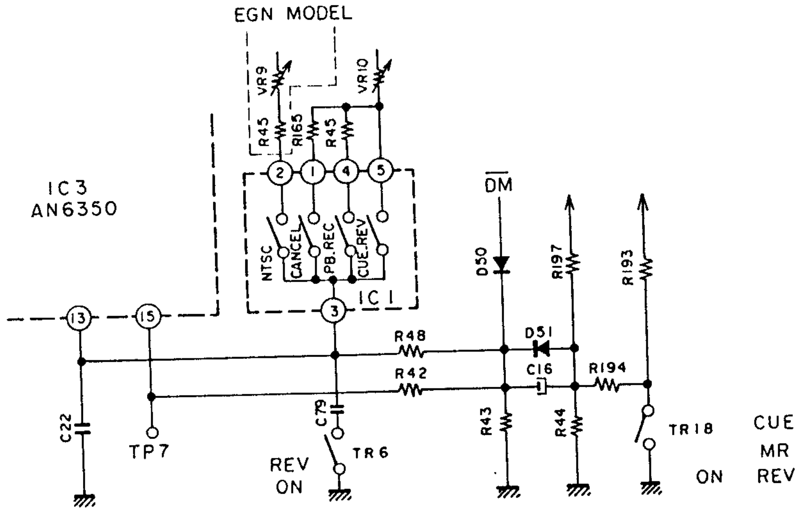

EGN MODEL
VR9
VR10
R45
R165
R45
IC3
AN6350
NTSC
CANCEL
PB.REC
CUE.REV
IC1
DM
D50
R197
R193
R48
D51
R42
C16
R194
C22
TP7
C79
TR6
REV
ON
R43
R44
TR18
ON
CUE
MR
REV

Fig. 5-51

1) Speed switching (For SW modes, see Fig. 5-50(b))
   The drum speed varies according to C22 and the value of the resistor R connected to each switch (SW) in IC1. In the "phase lock" condition, variation in this time constant results in variation in the PHASE DET voltage.
2) Phase compensation
   Before the PHASE DET voltage appearing at pin ⑤ of IC3 can be applied to the speed system, it must have its phase corrected and have the correct gain. R42, R43, C16 and R44 are for phase correction, while R48 is primarily for obtaining the correct gain. Other diodes and resistors are used to provide for charging of C16, voltage shift, discharging, etc., so as to ensure quick response.
   ⓐ R197 (R193 + R194): to cause a voltage drop of 1.8V across R44 when the power is turned on.
   ⓑ TR18 and R194: to cause a voltage change across R44 during CUE, REVIEW or MOTOR REVERSE operation.
   ⓒ D50: to permit supplementary charging at drum motor stop time.
   ⓓ D51: to serve as a limiter.

5-1-3. REC CTL/Mono-stable Multivibrator (MM) Switching

The M.M. (㉗ of IC-3: AN6350) not only acts as a V. PULSE frequency dividing gate, but also is used as the REC. CTL signal. However, during CUE, REVIEW or REC CANCEL operations, the V. PULSE repetition rate becomes 150 Hz (three times the original value) and thus the gate causes the malfunction of the frequency-dividing flip-flop (F.F.).
To avoid this, IC16 is turned on so that the action of the M.M. is stopped.

5-1-4. SLOW STILL/Quasi-V. SYNC Switching

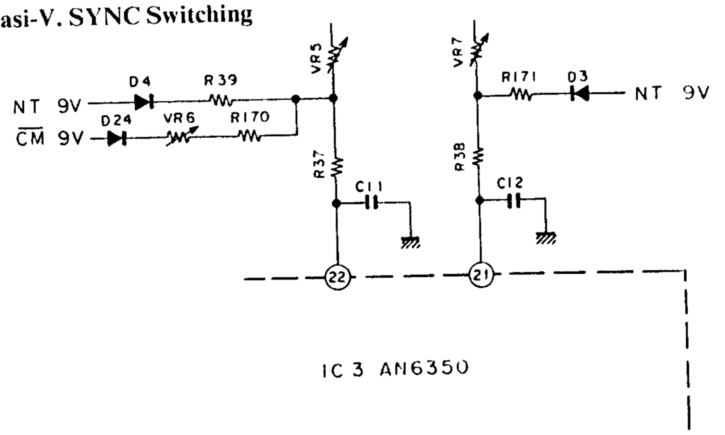

NT 9V
CM 9V
D4
R39
D24
VR6
R170
VR5
R37
C11
VR7
R171
D3
NT 9V
R38
C12
22
21
IC3 AN6350

Fig. 5-52

The quasi-V SYNC for the TRICK/PLAY modes is produced from the SW pulse in IC50 (microcomputer). "V" is changed during CUE or other TRICK modes. However, since the duty of V. SYNC is 50%, a "V" tremor of 1.5H appears on the screen because of mismatch of the recording pattern during SLOW mode.
This "tremor" varies in size depending on the type of monitor TV, and it can be adjusted even from outside by VR6 (service adjustment VR).

5-1-5. SW Point Switching for NTSC (EGN model)

The time constant of D4 and R39, or D3 and R171 connected in parallel with VR5 or VR7 (Fig. 5-52) permits setting of the SW point so that V. SYNC is at 6.5H even for EGN operation.

5-1-6. Picture Tremor (H) Correction Circuit (SLOW mode)

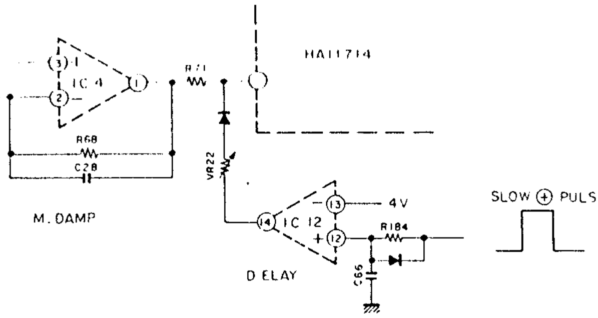

IC 4
R71
HA11714
R68
C28
M.DAMP
VR22
IC 12
4V
R184
DELAY
C66
SLOW ⊕ PULSE

Fig. 5-53

During SLOW mode, the tape repeats a move-and-stop sequence, and the relative difference in its speed causes a horizontal "tremor" of the picture. To reduce it, the drum motor is synchronized with the SLOW + pulse for correction.

5-1-7. Construction and Operating Principle of the Drum Motor

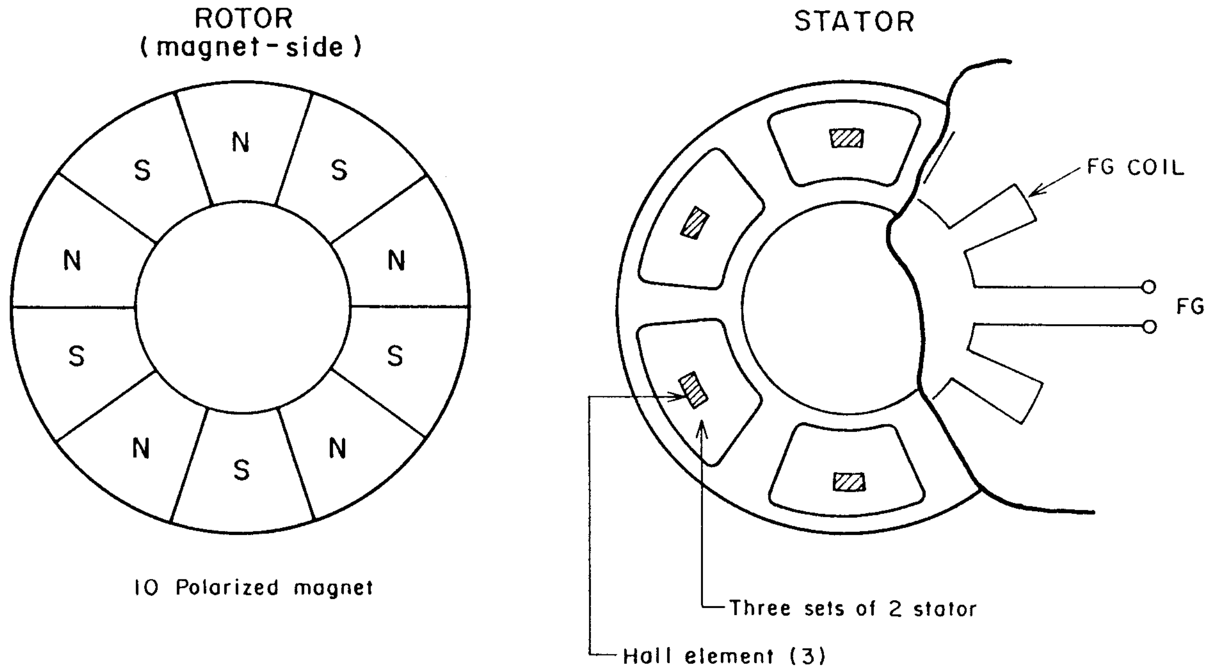

ROTOR
(magnet-side)
N
S
S
N
N
S
S
N
S
N
10 Polarized magnet
STATOR
FG COIL
FG
Three sets of 2 stator
Hall element (3)

Fig. 5-54 Construction of Drum Motor

The drum motor is a 3-phase brush-less motor, and its construction is shown in Fig. 5-54.
The motor operates on the principle that an electromagnetic force is produced by a current flowing through a conductor placed in a magnetic field. In other words, current is made to flow through a coil to generate an electromagnetic force, which is then used to turn a rotor fitted with a magnet.

Also, to keep the rotor revolving, it is necessary to rotate the electromagnetic force (i.e., to develop a rotating field). The rotating field can be produced by switching the current flowing through the coil. Fig. 5-55 and 5-56 show how this switching is done by means of transistor switching using a voltage derived from the "HALL" IC.

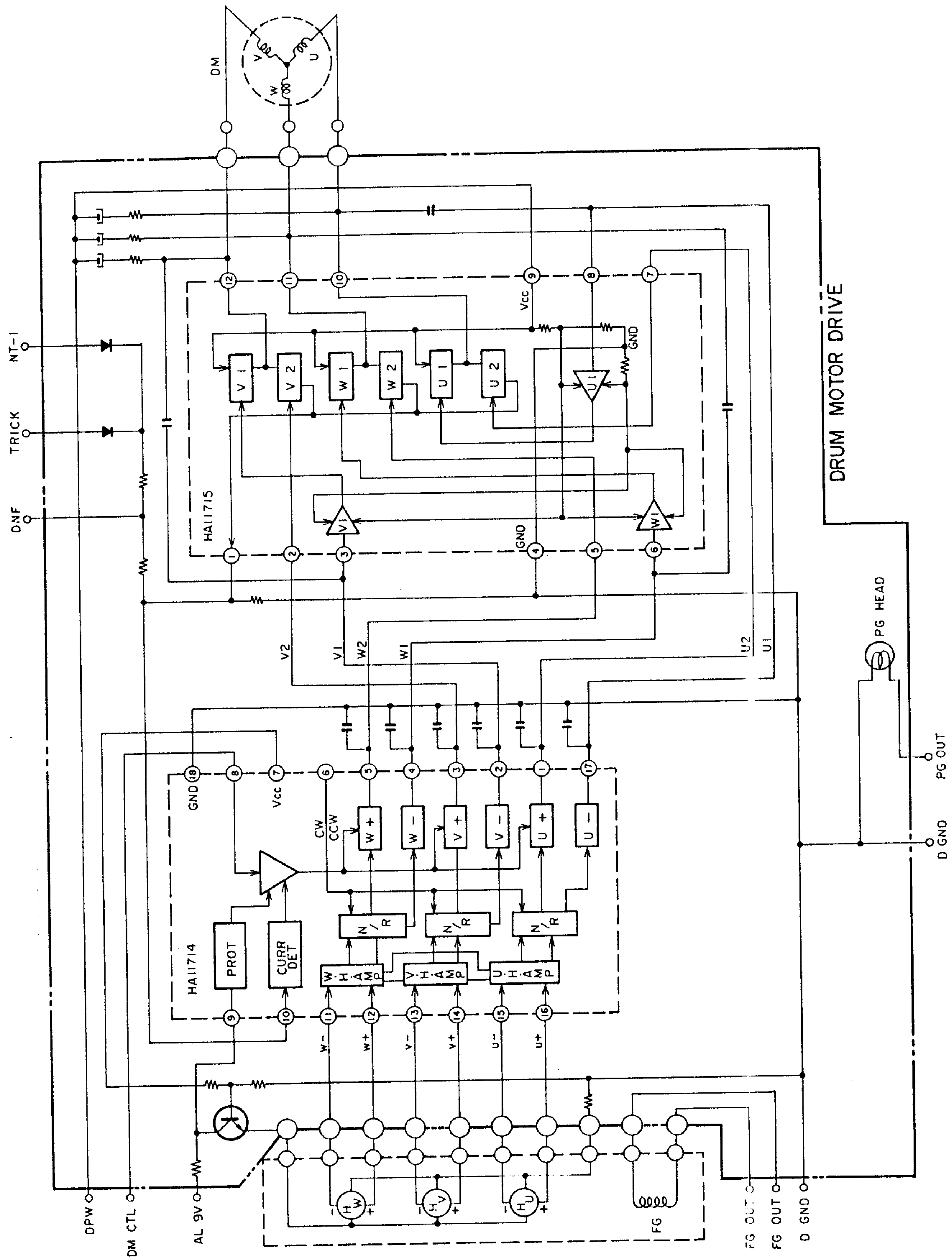

DM
U
V
W
DRUM MOTOR DRIVE
NT-1
TRICK
DNF
HA11715
Vcc
GND
V1
V2
W1
W2
U1
U2
PG HEAD
PG OUT
D GND
HA11714
PROT
CURR DET
CW
CCW
W+
W−
V+
V−
U+
U−
N/R
W·H·AMP
V·H·AMP
U·H·AMP
w−
w+
v−
v+
u−
u+
DPW
DM CTL
AL 9V
FG
FG OUT
D GND

Fig. 5-55

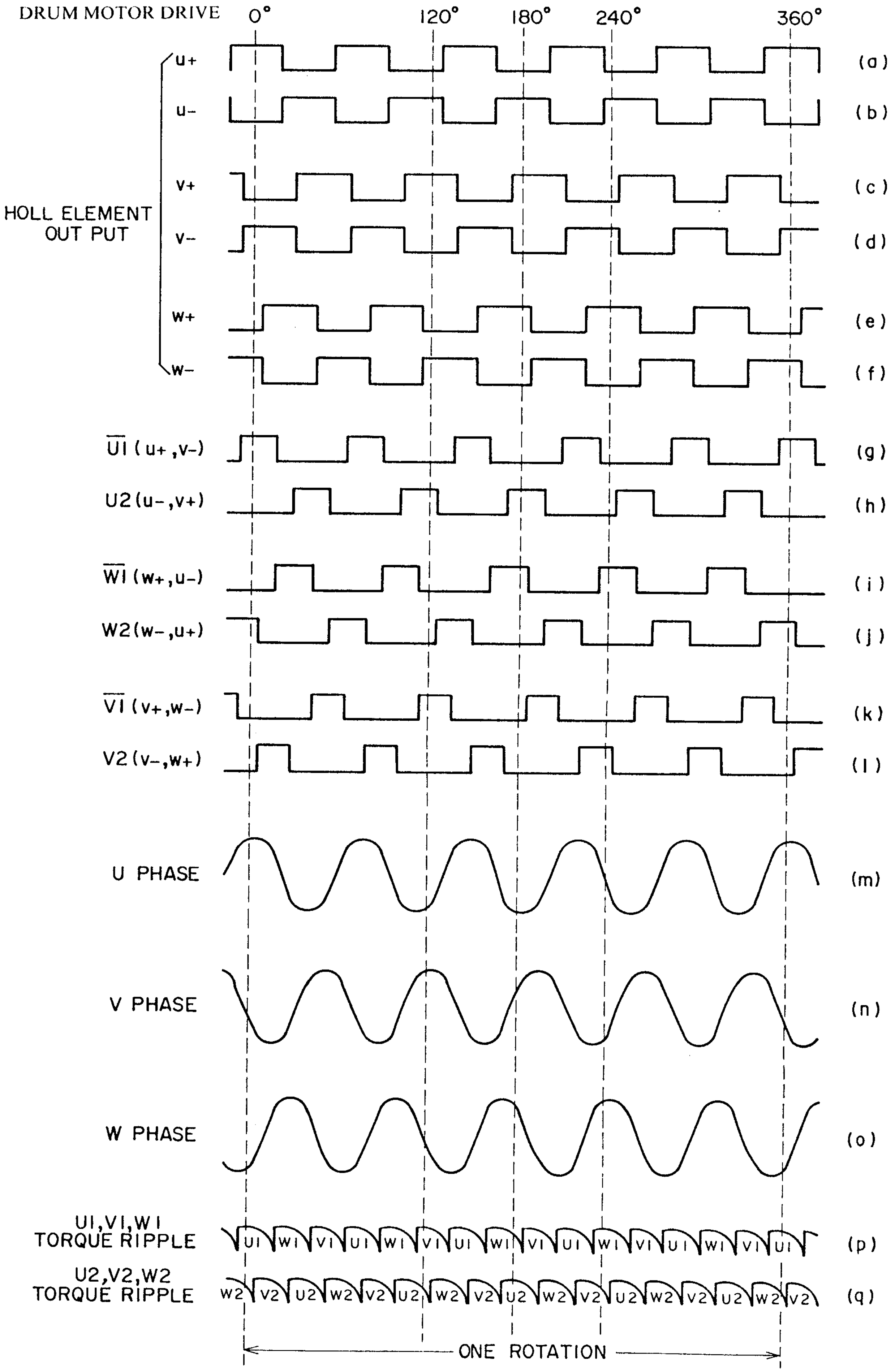


Fig. 5-56

5-2. CAPSTAN SERVO DESCRIPTION

5-2-1. CAPSTAN Speed Change

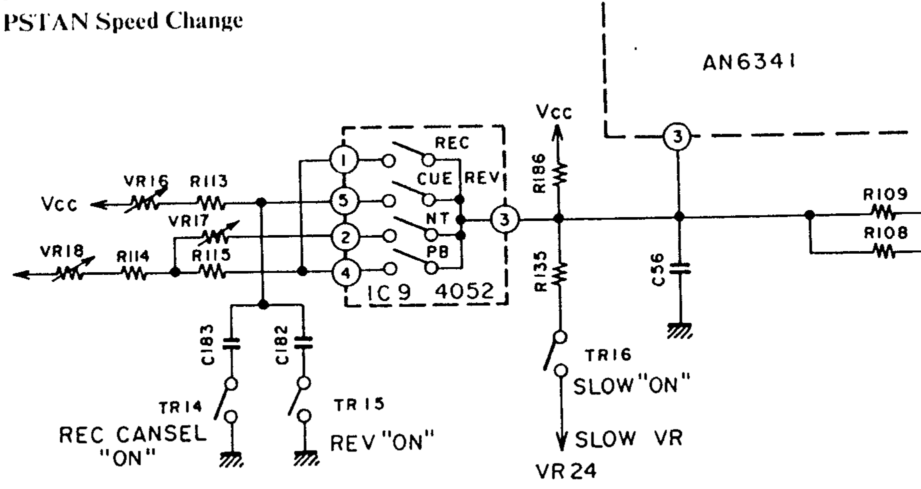

AN6341
Vcc
REC
CUE
REV
NT
PB
IC9 4052
VR16
R113
VR17
R115
VR18
R114
Vcc
R186
R135
C56
R109
R108
PHASE
C183
C182
TR14
REC CANSEL "ON"
TR15
REV "ON"
TR16
SLOW "ON"
SLOW VR
VR24

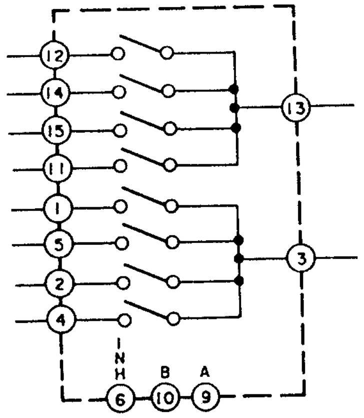
Fig. 5-57

The speed of the capstan motor is determined by the time constant of R with C56 and additional "C".
The speed modes in use are shown in Fig. 5-58.

MODE	SW. ON	CAPSTAN
1. REC	IC9①—③	666
2. NOR. PB	IC9④—③	666
3. CUE	IC9⑤—③	666 × 9 × 1.039
4. REV	IC9⑤—③ TR15	666 × 9 × 1/1.045
5. SLOW	IC9 OFF TR16	666 × (0.8 ±0.2)
6. NTSC (EGN)	IC9②—③	666 × 6/5
7. REC. CANCEL	IC9⑤—③ TR14	666 × 3 × 1.018

Fig. 5-58

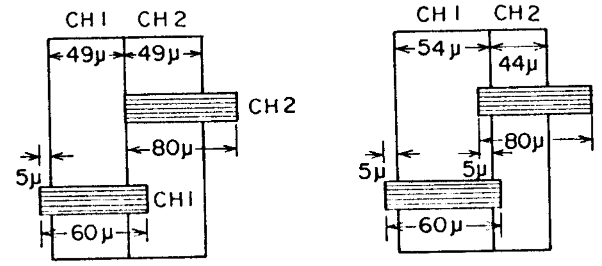
With IC9, switching is made through LOGIC CTL as shown in Fig. 5-59.


12
14
15
11
1
5
2
4
13
3
INH
B
A
6
10
9

MODE	INPUT SIGNAL A	B	1μH	CONNECTION
1. REC	0	0	0	⑫—⑬ ①—③
2. PB	1	1	0	⑪—⑬ ④—③
3. CUE. REV	1	0	0	⑭—⑬ ⑤—③
4. NT	0	1	0	⑮—⑬ ②—③
5. SLOW	1	0	1	OFF OFF

Fig. 5-59

5-2-2. Tracking Adjustment


CH1 CH2
49μ
49μ
CH2
80μ
5μ
CH1
60μ
CH1 CH2
54μ
44μ
80μ
5μ
5μ
60μ

a
REF TAPE PLAY BACK

b
SELF REC/PB

Fig. 5-60

1) The tracking adjustment involves adjusting the positional relationship between the head and video track by varying the phases of the CTL signal and reference V signal. On VP-88, the CTL signal is delayed 2ms relative to the reference signal to ensure compatibility with other makers' products.
This results in the heads tracing paths as illustrated in Fig. 5-60; thereby promising an advantage during normal playback operation.

2) With CUE tracking, the CTL position is likely to vary mechanically, and therefore a preset VR has a wider "variable range" than the external tracking control.

3) The NTSC tracking employs the CTL position which is almost the same as with PAL, and therefore the tracking VR is intended for use also with PAL, with the time constant being reduced about 20%.

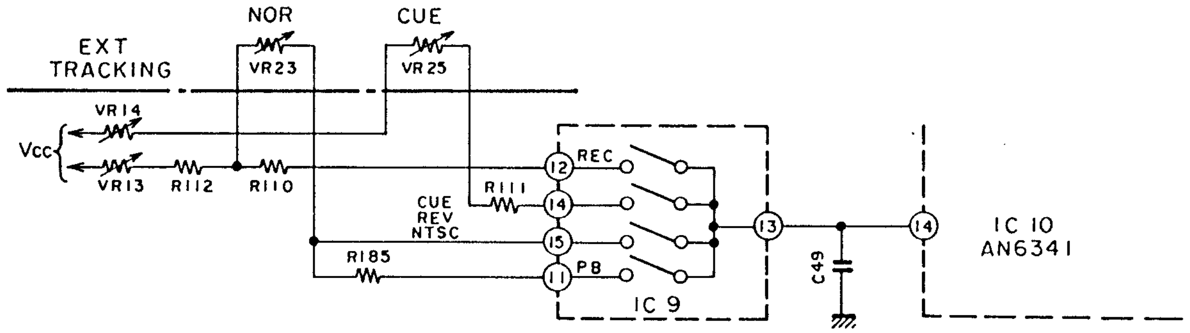

EXT TRACKING
NOR
VR23
CUE
VR25
VR14
Vcc
VR13
R112
R110
REC
CUE REV NTSC
R111
R185
PB
IC9
C49
IC10 AN6341

Fig. 5-61

The switch operation on IC9 is interlocked with the switch operation for the speed system. (See Fig. 5-59)

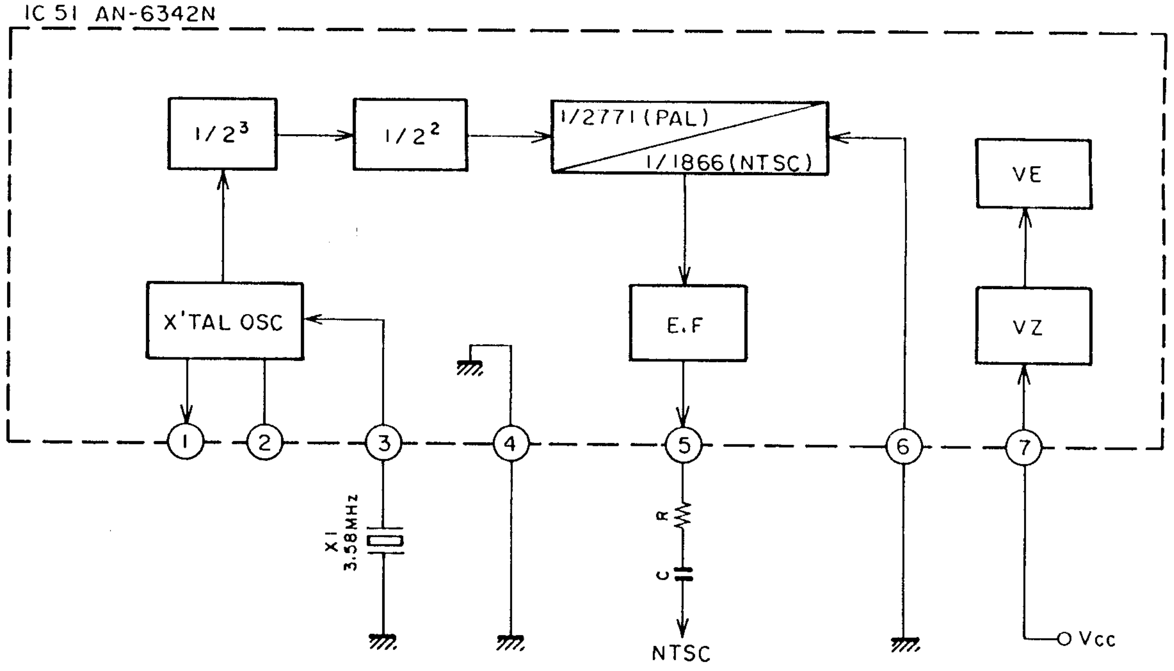

IC 51 AN-6342N
1/2³
1/2²
1/2771 (PAL)
1/1866 (NTSC)
VE
X'TAL OSC
E.F
VZ
1
2
3
4
5
6
7
X1 3.58MHz
R
C
NTSC
Vcc

Fig. 5-62

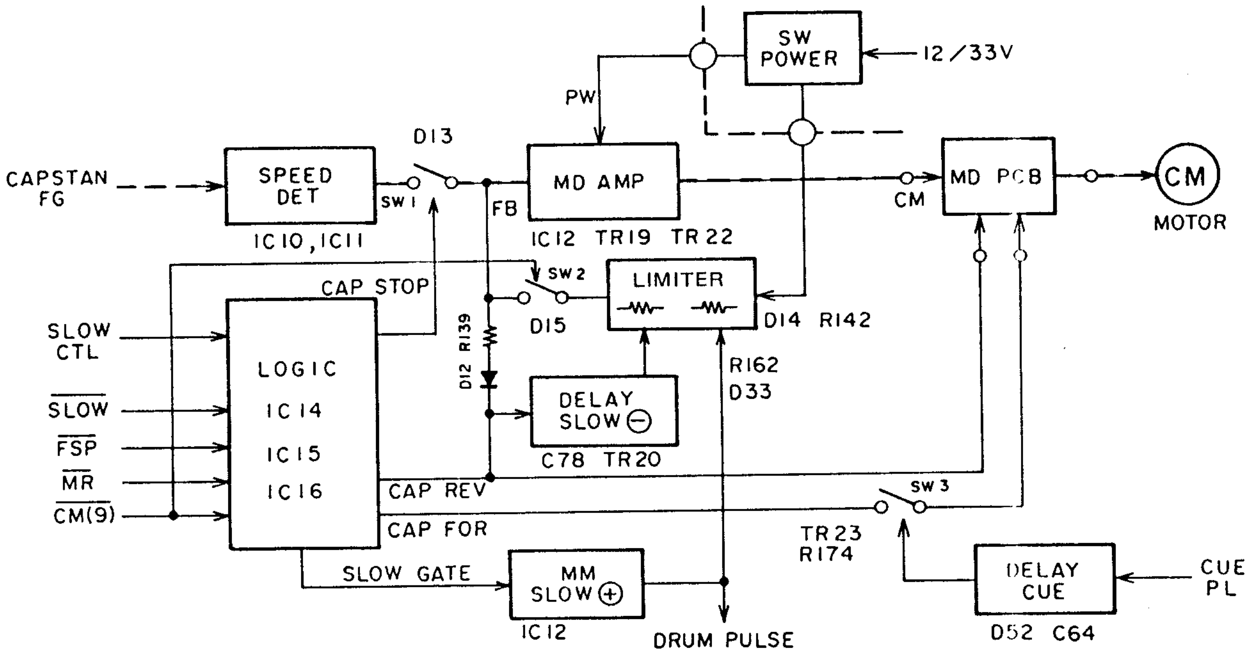
4) NTSC Syncronized 60 Hz Generating Circuit
The NTSC system has a vertical synchronized signal frequency of 60 Hz. Therefore, when playing back a NTSC tape, this 60 Hz vertical synchronized signal should be the standard signal.
As is shown in Fig. 5-62, this signal is generated in the Servo & Syscon PCB IC 51 AN 6342N, of which operation is as follows. X1 is used also for XTAL of Mi-Con IC (IC50) in the Syscon Circuit (MB8851) and its oscillating frequency is 3579545 Hz. This signal is fed via pin ③ into the circuit, passes through XTAL oscillator in the IC, and is counted down in the next stage onward to $\times \frac{1}{2^2} \times \frac{1}{1866} = 59.9468$ Hz,

$$3579545 \times \frac{1}{2^3} \times \frac{1}{2^2} \times \frac{1}{1866} = 59.9468 \text{ Hz.}$$

(Since pin ⑥ is grounded, NTSC (1/1866) is supplied. In this way, NTSC synchronized signal of 59.94 Hz is generated.)

5-2-3. Capstan Mode Switching

The capstan motor has three operation modes; forward, reverse and braking. Each of these modes requires an instantaneous response.



SW POWER
12/33V
PW
D13
CAPSTAN FG
SPEED DET
SW1
IC10, IC11
MD AMP
FB
IC12 TR19 TR22
MD PCB
CM
CM
MOTOR
CAP STOP
SW2
LIMITER
D14 R142
SLOW CTL
SLOW
FSP
MR
CM(9)
LOGIC
IC14
IC15
IC16
D12 R139
D15
DELAY SLOW ⊖
C78 TR20
R162
D33
CAP REV
CAP FOR
SW3
SLOW GATE
MM SLOW ⊕
IC12
DRUM PULSE
TR23
R174
DELAY CUE
D52 C64
CUE PL

Fig. 5-63

1) During normal operation, SW1 is turned ON, SW2 OFF and SW3 ON. The operation is not affected by LIMITER and DELAY.
2) With SLOW STILL, SW2 is turned on by CM (9), and LIMITER and other circuits operate.
3) SW3 is used with DELAY so that the capstan motor can be braked after a delay of 0.1 to 0.2 sec to avoid slack being produced in the plunger (PLG) operation at the time the mode is switched from CUE to STOP or NORMAL PB.

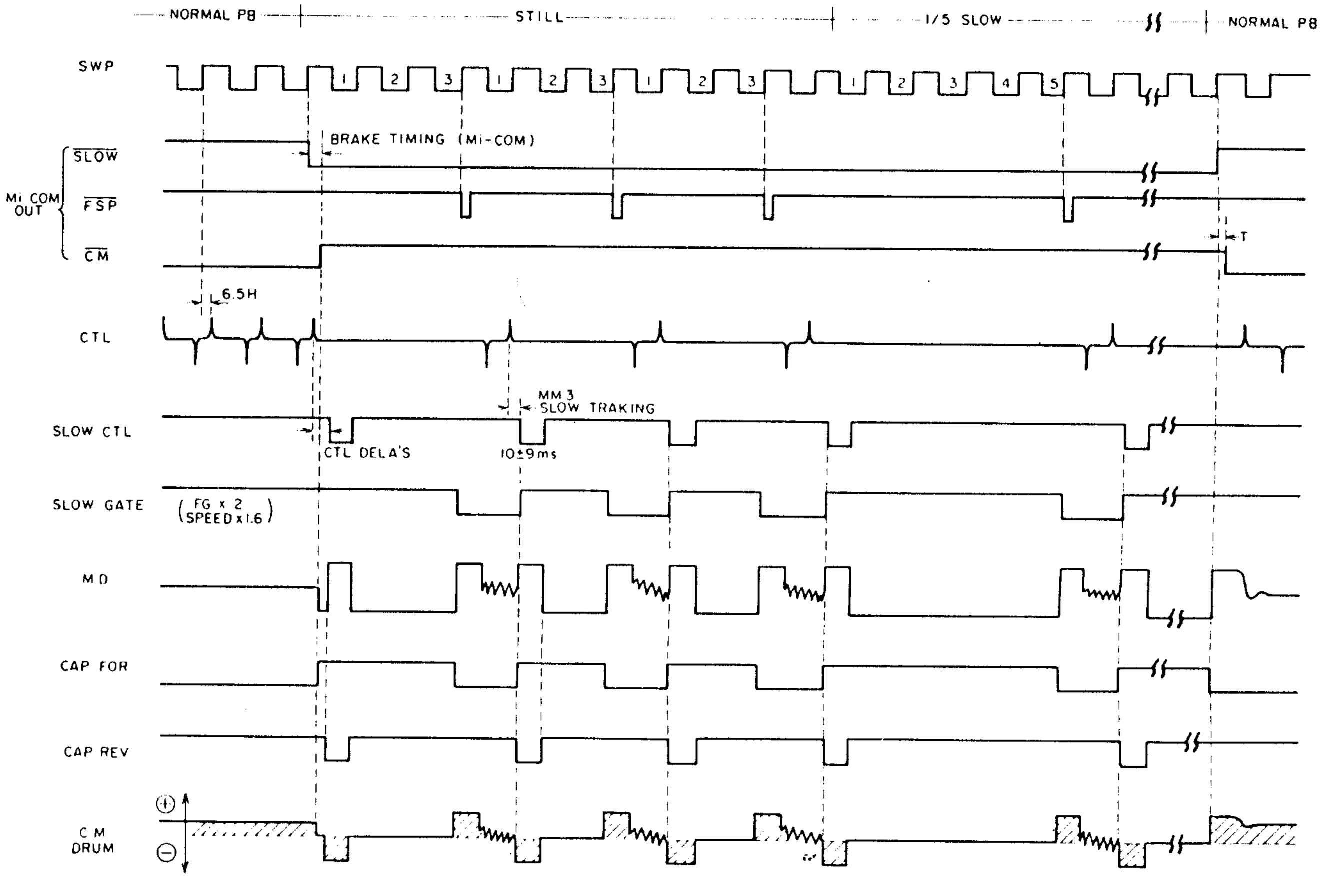
5-2-4. Capstan Control during SLOW Mode

In Fig. 5-63, LOGIC and its associated circuits are mainly for the SLOW operation. These circuits, with addition of the SLOW tracking circuit, serve as the SLOW circuit. (See Fig. 5-64)

The operation proceeds as follows:

First, the SLOW mode is established on the microcomputer, and then signal $\overline{FSP}$ is sent out. This signal causes SLOW GATE to go to "LOW", and the SLOW + pulse is supplied to the capstan motor. When the motor reaches a certain speed, FG SERVO is applied. This causes the motor to rotate at a steady speed. However, since, the CTL signal decreases after a lapse of 30 to 40ms, SLOW CTL (CTL with proper tracking timing) is generated. This causes the SLOW – pulse to be supplied to the motor to complete one frame-playback cycle.

The SLOW speed is determined by the number of times this frame-playback cycle is repeated within a given time.



NORMAL PB
STILL
1/5 SLOW
NORMAL PB
SWP
1
2
3
4
5
BRAKE TIMING (Mi-COM)
Mi COM OUT
SLOW
FSP
CM
T
6.5H
CTL
MM 3
SLOW TRAKING
SLOW CTL
CTL DELA'S
10±9ms
SLOW GATE
(FG x 2 / SPEED x 1.6)
MD
CAP FOR
CAP REV
⊕
⊖
C.M DRUM

Fig. 5-64 C.M SLOW CONTROL

5-3. OTHER ASSOCIATED CIRCUITS

5-3-1. Mode LOGIC

LOGIC is gate circuitry that converts microcomputer outputs to signals suited for actual use.

There are two such circuits: LOGIC 1, which controls the power to IC1, IC9 and IC7; and LOGIC 2, which controls the capstan motor.

1) LOGIC 1

Fig. 5-65 shows the LOGIC 1 circuit and its operation. The control voltage given in the figure is used in the switching operation shown in Figs. 5-50(b) and 5-59.

2) LOGIC 2

This circuit produces voltages used to control the capstan motor system (Fig. 5-63).

Its operation, and inputs and outputs involved, are shown in Fig. 5-66.

SW control voltage (IC1, IC9) in each mode (Logic 1)

MODE	IN					OUT				
	PB1	CUE	CAN	MR	NT	DRUM (IC1) Ⓐ	DRUM (IC1) Ⓑ	CAPSTAN (IC9) Ⓐ	CAPSTAN (IC9) Ⓑ	IC7 Vcc
REC	0	0	0	0	0	1	1	0	0	0
REC CANCEL	1	0	1	1	0	0	0	1	0	1
REC PAUSE	0	0	1	1	0	1	0	0	0	1
PB	1	0	0	0	0	1	1	1	1	0
CUE	1	1	0	0	0	1	0	1	0	1
REV	1	0	1	1	0	1	0	1	0	1
SLOE	1	0	0	0	0	1	1	1	1	1
NT	1	0	0	0	1	0	1	0	1	0
REC SEARCH	0	1	0	0	0	1	0	1	0	1
AEC REC	0	0	1	1	0	0	0	1	0	1

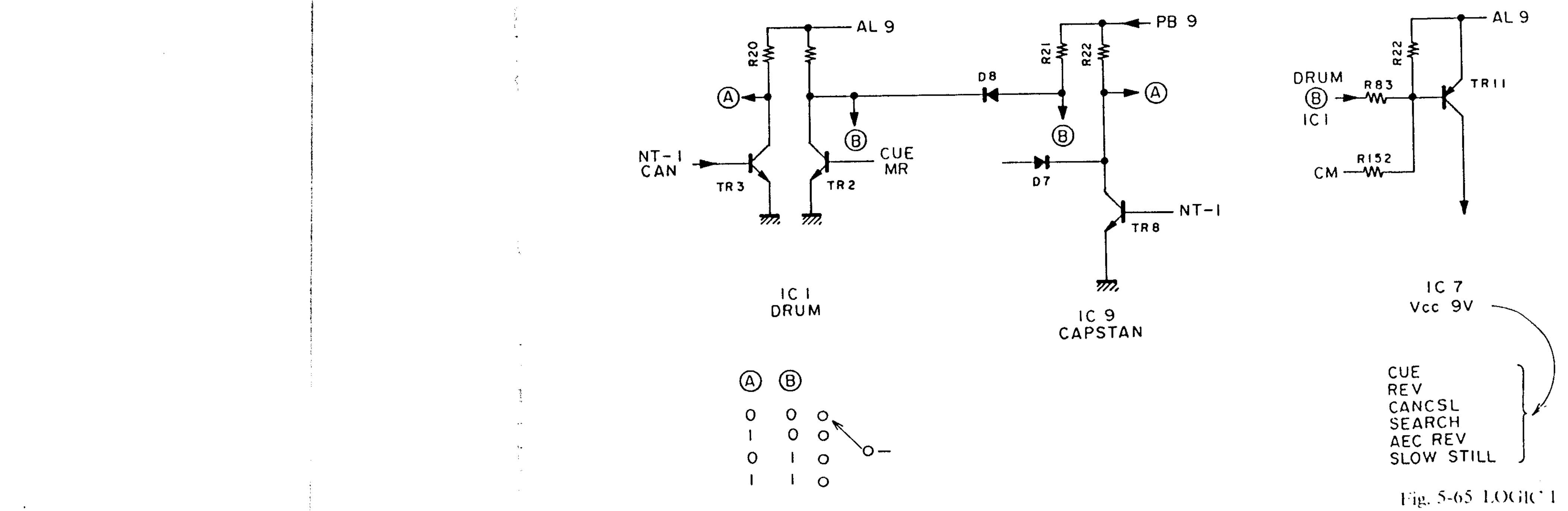

AL 9
R20
Ⓐ
NT-1
CAN
TR3
TR2
Ⓑ
CUE
MR
D8
R21
R22
PB 9
Ⓐ
Ⓑ
D7
TR8
NT-1
IC 1
DRUM
IC 9
CAPSTAN
Ⓐ Ⓑ
0 0
1 0
0 1
1 1
DRUM
Ⓑ
IC1
R83
R22
TR11
AL 9
R152
CM
IC 7
Vcc 9V
CUE
REV
CANCSL
SEARCH
AEC REV
SLOW STILL

Fig. 5-65 LOGIC 1

SW mode logic out (Logic 2)

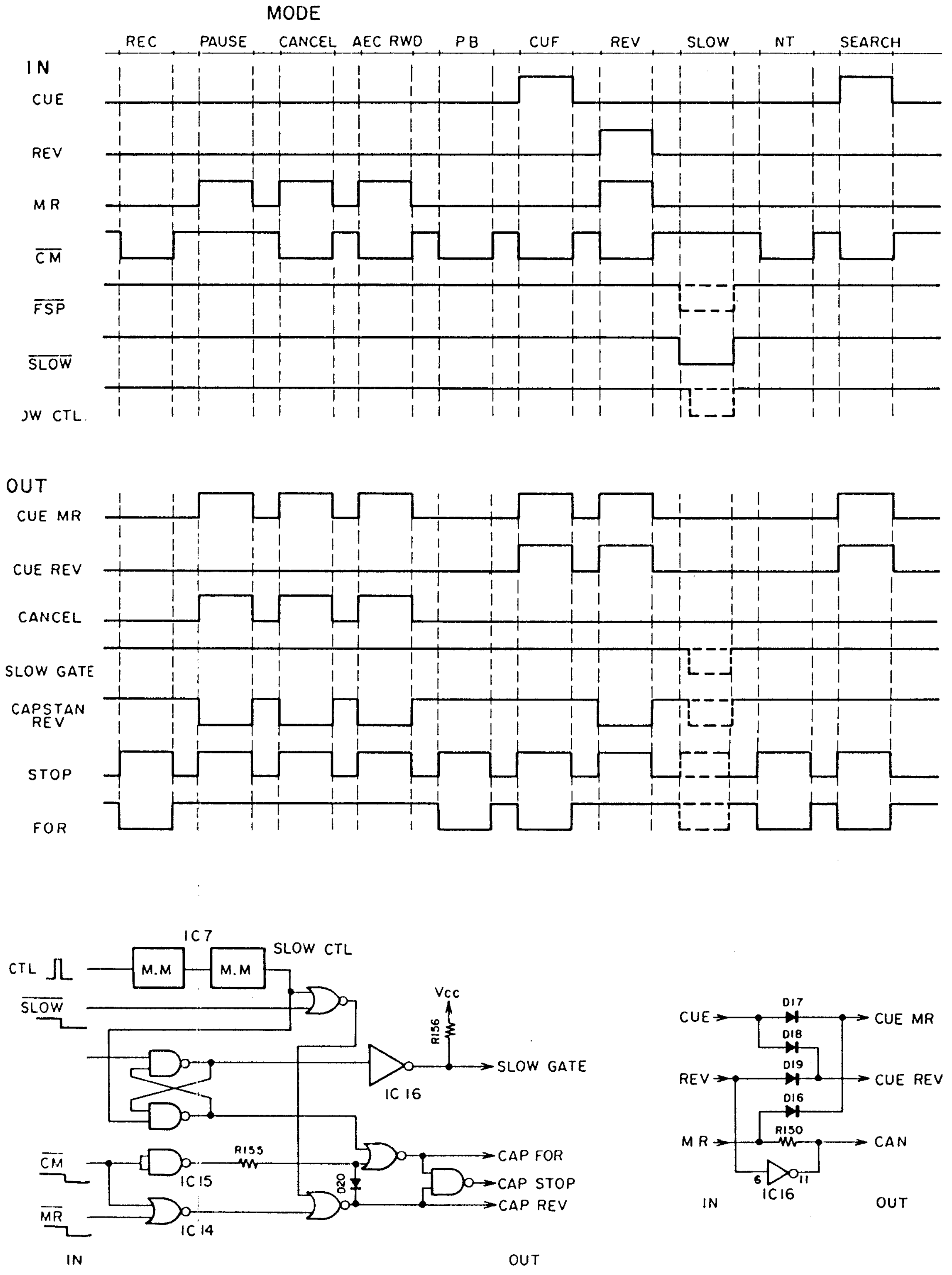

MODE
REC
PAUSE
CANCEL
AEC RWD
PB
CUF
REV
SLOW
NT
SEARCH
IN
CUE
REV
MR
CM
FSP
SLOW
W CTL.
OUT
CUE MR
CUE REV
CANCEL
SLOW GATE
CAPSTAN REV
STOP
FOR
IC7
M.M
M.M
SLOW CTL
CTL
SLOW
Vcc
R156
SLOW GATE
IC 16
CM
IC15
R155
MR
IC 14
D20
CAP FOR
CAP STOP
CAP REV
IN
OUT
CUE
D17
D18
D19
D16
R150
CUE MR
REV
CUE REV
MR
CAN
6
11
IC16
IN
OUT

Fig. 5-66 LOGIC 2

5-3-2. CTL Output Delay

The REC SEARCH function provided by the microcomputer uses the CTL signal to search for the recording pattern. However, a pulse width of 2msec or so is required for detection purposes.

Therefore, to obtain a 2 msec pulse from the CTL 0.8 msec pulse, the charge/discharge voltage (D6, C42 and R81) has its waveform corrected by TR10 and TR9.

5-3-3. Test Circuit

The capstan motor is rotated in synchronization with the reference V. SYNC, and therefore the speed during recording is directly affected by the accuracy of the mechanical parts employed.

Necessary measurement in the PB mode can be made by playing back the reference tape (1 kHz) on AUDIO with the REC mode established on the SERVO system.

The test circuit is employed to put only the SERVO system into the REC mode at the time of palyback.

Connecting TP10 and TP5 with a lead causes the REC voltage to be supplied to IC3 from TP10, resulting in the REC mode being established. This in turn causes the REC pulse to appear at CTL, and therefore TR4 is used to avoid duplicate recording.

5-3-4. Drum Power Switching Circuit

The drum motor uses switched power to save power consumption. However, since the operating point is shifted at EGN/TRICK mode, the SW power is turned off except for Normal REC/PB and AL12V is used instead. The circuit is designed to force the drum feedback voltage to vary by means of D31 and D25.

5-3-5. Capstan Phase-Lock Speed-up Circuit

To ensure stabilized AEC picture, prompt PB operation, minimized wow during (Normal PB), etc., the constant of the cpastan phase correction circuit is varied in two steps during NORMAL REC/PB operation.

If the system is disturbed extensively or at motor start up time, a phase system error results in GND or power trouble.

If TP2 is grounded, detection is made by TR13 and C53 is charged via D10. The voltage developed sets the IC11 switch to SPEED UP, thereby making the system response faster.

The voltage at C53 is discharged via R147, bringing the response back to the normal level in 1 to 2 seconds.

With the TRICK mode, C53 is charged via D11, resulting in a faster system response.

5-3-6. CUE/REVIEW CTL Sensitivity Switching

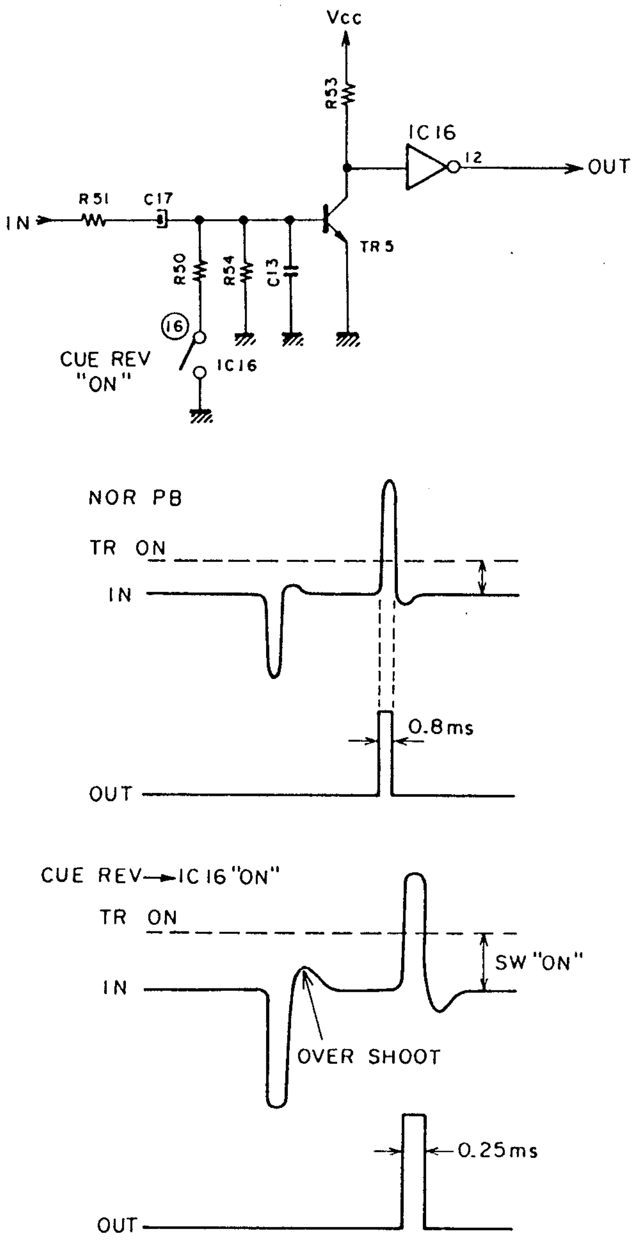

Vcc
R53
IC16
12
OUT
IN
R51
C17
R50
R54
C13
TR5
16
CUE REV "ON"
IC16
NOR PB
TR ON
IN
0.8ms
OUT
CUE REV→IC16 "ON"
TR ON
SW "ON"
IN
OVER SHOOT
0.25ms
OUT

Fig. 5-67

During CUE/REVIEW operation, the tape speed becomes faster, resulting in increased CTL output. However, the CTL trigger amplifier acts improperly due to overshoot, causing disturbance to the SERVO.

The switching circuit and associated input/output waveforms are shown in Fig. 5-67. The CTL signal supplied via R51 has its voltage divided by R50 and then is turned into a pulse by the "ON" voltage at TR5.

VIDEO-CTL phase at AEC time (For PB/REC, REC RWD)

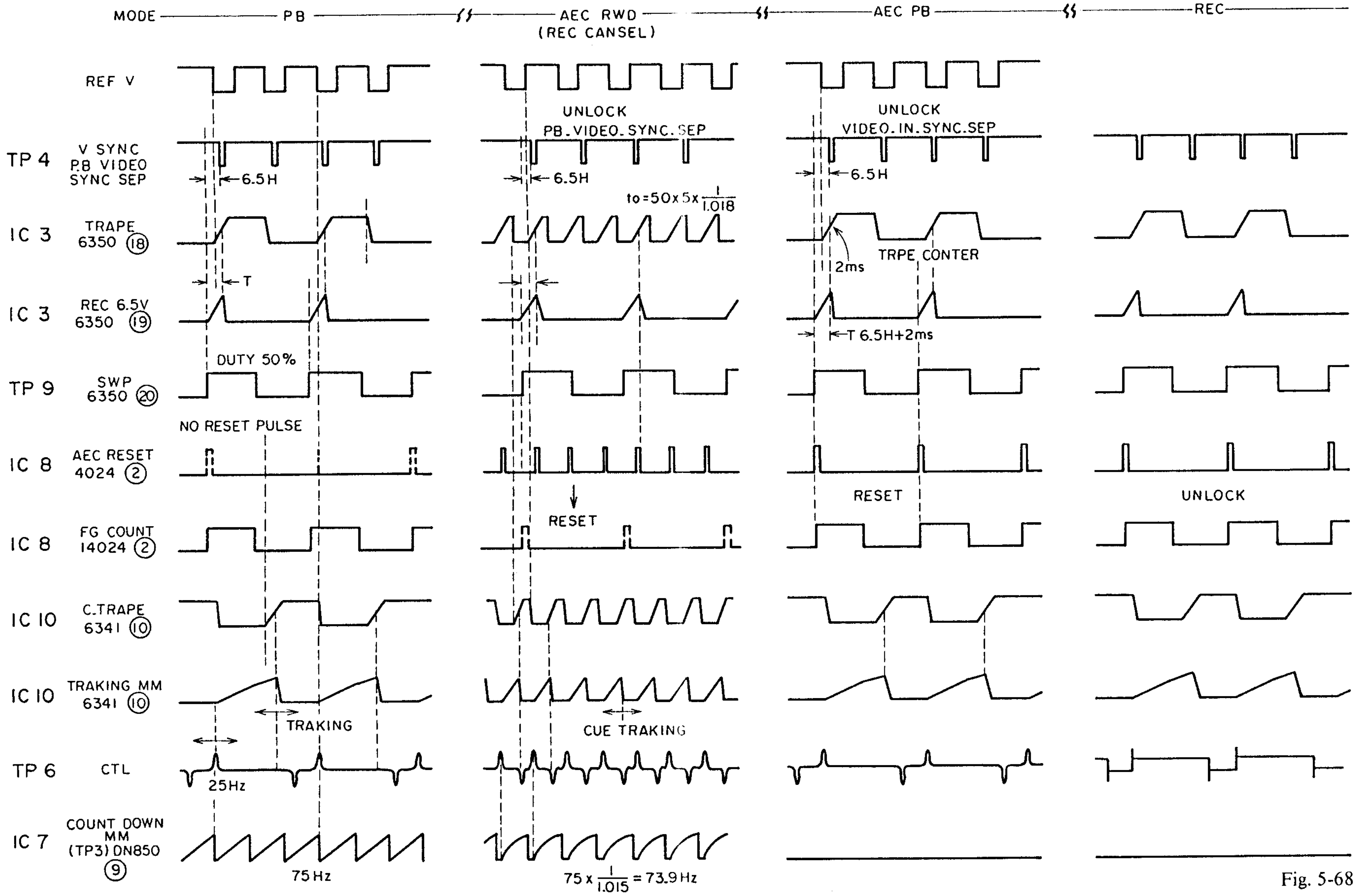

MODE
PB
AEC RWD
(REC CANSEL)
AEC PB
REC
REF V
TP 4
V SYNC
P.B VIDEO
SYNC SEP
UNLOCK
PB. VIDEO. SYNC. SEP
UNLOCK
VIDEO. IN. SYNC. SEP
6.5H
6.5H
6.5H
to=50x5x $\frac{1}{1.018}$
IC 3
TRAPE
6350 ⑱
T
TRPE CONTER
2ms
IC 3
REC 6.5V
6350 ⑲
T 6.5H+2ms
DUTY 50%
TP 9
SWP
6350 ⑳
NO RESET PULSE
IC 8
AEC RESET
4024 ②
RESET
RESET
UNLOCK
IC 8
FG COUNT
14024 ②
IC 10
C.TRAPE
6341 ⑩
IC 10
TRAKING MM
6341 ⑩
TRAKING
CUE TRAKING
TP 6
CTL
25Hz
IC 7
COUNT DOWN
MM
(TP3) DN850
⑨
75Hz
75 x $\frac{1}{1.015}$ = 73.9Hz

Fig. 5-68

5-3-7. Timing Chart

Fig. 5-68 shows the timing chart for Normal PB/REC, and REC. REW (REC. CANCEL) modes, where phases are charted with regard to REF. V.

The AEC. REW mode has the same timing as with CUE/REVIEW. However, since the speed is increased by a factor of 9, CTL has a frequency three times as high as the one during AEC REW operation.

Fig. 5-69 shows the number of capstan motor revolutions and CTL frequency in each mode.

Number of capstan motor revolutions and CTL frequency in each mode.

MODE	MODE INPUT								WAVEFORM (Hz)	CTL WAVEFORM (Hz) (TAPE SPEED)
	CUE	REV	MR	$\overline{\text{SLOW}}$	$\overline{\text{CM}}$	PB	REC	NTSC		
NOR. PB	0	0	0	1	0	1	0	0	800	25
CUE	1	0	0	1	0	1	0	0	800 × 9 × 1.04	25 × 9 × 1.04
REV	0	1	0	1	0	1	0	0	$800 \times 9 \times \frac{1}{1.046}$	$25 \times 9 \times \frac{1}{1.046}$
NTSC	0	0	0	1	0	1	0	1	$800 \times \frac{3}{2}$	30
REC	0	0	0	1	0	0	1	0	800 × 25 (REC)	
REC	0	0	1	1	0	0	0	0	$800 \times \frac{3}{1.108}$	$25 \times \frac{3}{1.018}$
PAUSE	0	0	1	1	1	0	0	0	0	0
REC CANCEL	0	0	1	1	0	1	0	0	$800 \times \frac{3}{1.15}$	$25 \times \frac{3}{1.018}$
SLOW	0	0	0	0	1	1	0	0 (NTSC : 1)	800 × 0.8 ± 0.2	$\frac{1}{n}$ (SLOW SPEED)
STILL	0	0	0	0	1	1	0	0 (NTSC : 1)	0	0

Fig. 5-69

6. LUMINANCE (Y) SIGNAL CIRCUIT

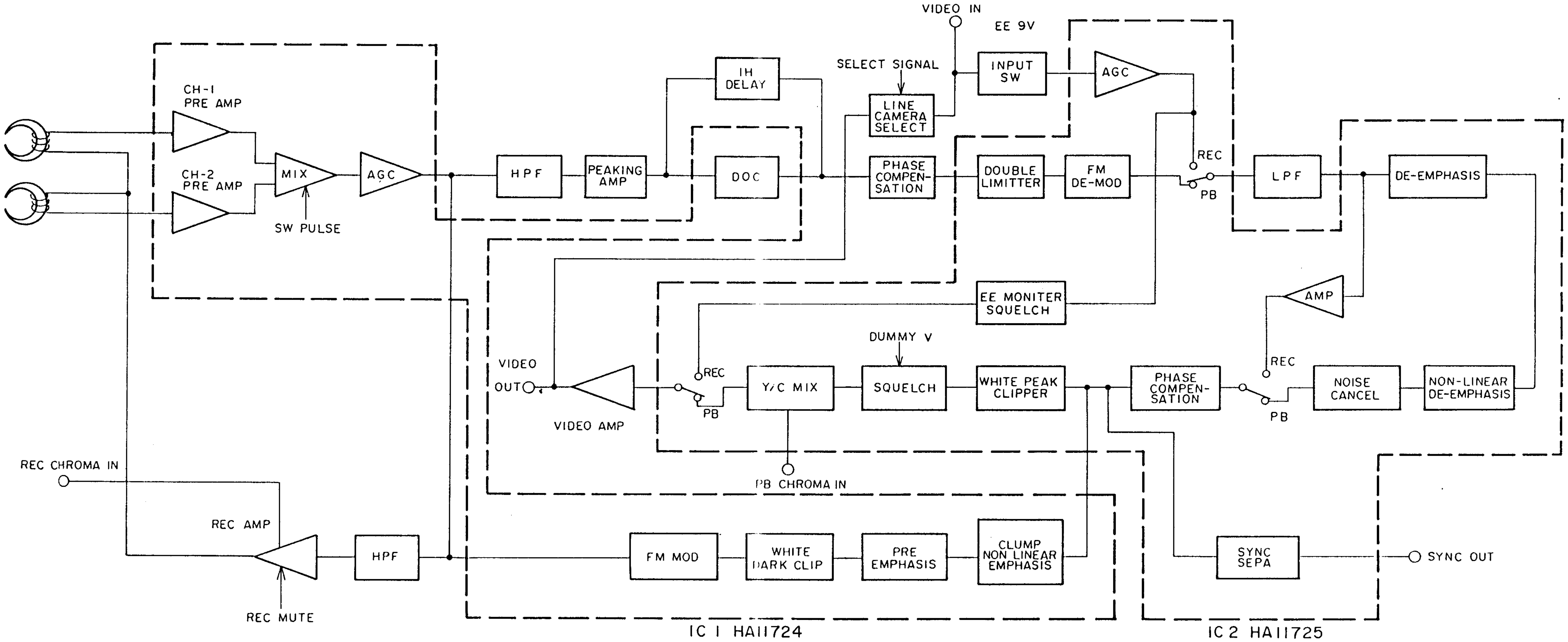

VIDEO IN
EE 9V
SELECT SIGNAL
INPUT SW
AGC
LINE CAMERA SELECT
IH DELAY
CH-1 PRE AMP
CH-2 PRE AMP
MIX
SW PULSE
AGC
HPF
PEAKING AMP
DOC
PHASE COMPEN-SATION
DOUBLE LIMITTER
FM DE-MOD
REC
PB
LPF
DE-EMPHASIS
EE MONITER SQUELCH
AMP
DUMMY V
VIDEO OUT
REC
PB
VIDEO AMP
Y/C MIX
SQUELCH
WHITE PEAK CLIPPER
PHASE COMPEN-SATION
REC
PB
NOISE CANCEL
NON-LINEAR DE-EMPHASIS
PB CHROMA IN
REC CHROMA IN
REC AMP
REC MUTE
HPF
FM MOD
WHITE DARK CLIP
PRE EMPHASIS
CLUMP NON LINEAR EMPHASIS
SYNC SEPA
SYNC OUT
IC I HA11724
IC 2 HA11725

Fig. 5-70 VP-88 Luminance (Y) Signal Circuit Block Diagram

The Y. signal circuit on VP-88 is characterized by its small size (the PCB area is about half of that on VS-5) thanks to use of high-density ICs, and efficient circuit design.

Fig. 5-70 shows the block diagram of the Y signal circuit, which is made up of IC-1 (HA-11724) and IC-2 (HA-11725). These high-density ICs provide all of the circuitry formerly contained on three separate ICs (HA-11701, -11703, and -11716), plus additional circuitry.

The circuitry covered by the new ICs (HA-11724 and HA-11725) is as follows:

● HA-11701...............	REC AGC, FM modulation, white clip, dark clip, and pre-emphasis.
● HA-11703...............	FM demodulation, Noise cancel, and SYNC SEP.
● HA-11716...............	Pre-amplifier, PB AGC, and double limiter.
Additional...............	Non-linear emphasis, non-linear de-emphasis, white peak clipper, and phase compensator.

6-1. Y RECORDING CIRCUIT DESCRIPTION

6-1-1. Input Switch/Line-Camera Switching

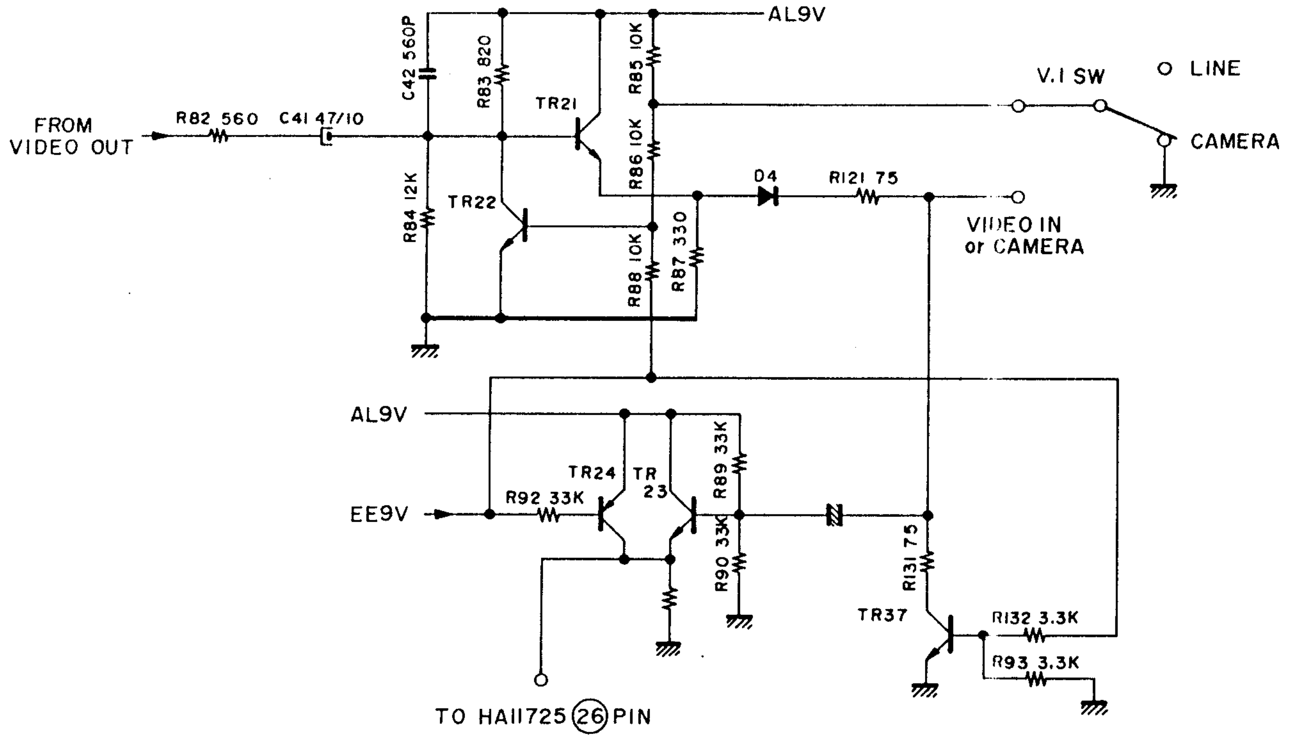

AL9V
C42 560P
R83 820
R85 10K
TR21
V.I SW
O LINE
CAMERA
FROM VIDEO OUT
R82 560
C41 47/10
R86 10K
D4
R121 75
R84 12K
TR22
R88 10K
R87 330
VIDEO IN or CAMERA
AL9V
EE9V
TR24
TR 23
R92 33K
R89 33K
R90 33K
R131 75
TR37
R132 3.3K
R93 3.3K
TO HA11725 ㉖ PIN

Fig. 5-71 Input Switch/Line-Camera Switching

This circuit consists of the input switch for supplying the VIDEO signal to pin ㉖ of HA11725 only at recording or EE time, and the line-camera switching circuit, for example, providing control over camera recording/playback (at the time the camera is connected) and sending the playback signal to the camera's electronic viewer. Note that this circuit is located on the chroma PCB.

In Fig. 5-71 above, TR23 and TR24 form the input switch. The input signal is supplied to pin ㉖ of HA11725 only when EE9V is available.

TR21 and TR22 make up the line/camera switching circuit.

The playback signal is sent out to the VIDEO IN terminal when the video input switch is set to the camera position.

6-1-2. AGC (HA11725)

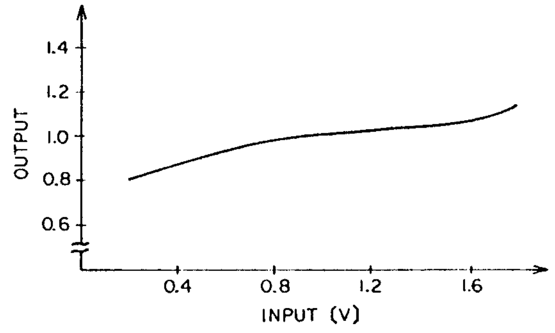


Fig. 5-72 AGC Characteristics

A signal routed to pin ㉖ of HA11725 is then supplied to AGC. The AGC on HA11725 is of the "peak + keyed" type, and is similar to the one employed on HA11701. Its characteristics are shown in Fig. 5-72.

The output level from AGC is varied by VR-7 (pin ㉗), thereby providing deviation adjustment. Additionally, the time constant of AGC is determined by the combined capasitance resistance at pins ㉖ and ②.

6-1-3. Low Pass Filter (LPF)

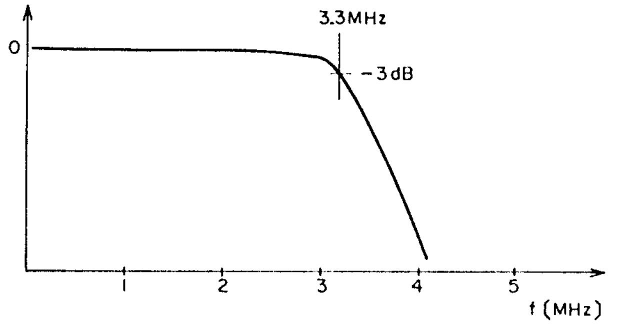


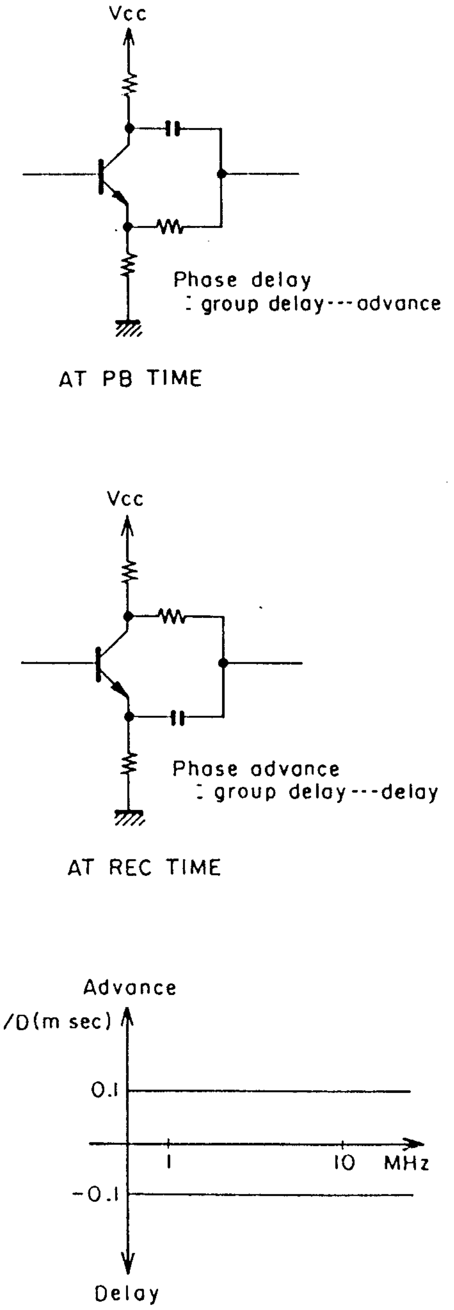
Fig. 5-73 LPF f-Characteristics

A portion of the signal from AGC is supplied to the EE monitor squelch circuit and then routed to pin ⑤ (VIDEO OUT) via EE PB switch.

The remaining (main) portion of the signal goes to LPF, where a chroma signal of 4.43 MHz is removed. On VP-88, the circuit construction is such that LPF is used during both recording and playback operation. This arrangement is different from the one employed on VS-5 in which separate LPFs are used for recording and playback. The VP-88 approach reduces the number of filters in use resulting in reduction of component parts and cost. On the other hand, the VS-5 approach ensures optimum characteristics for both recording and playback, and therefore is considered more ideal. However, with VP-88, particular emphasis is placed on the LPF characteristic for the PB system. The characteristic for recording is also made satisfactory by adding a trap at 4.43 MHz.

The filters employed are a new type, requiring less than half the space formerly required in VS-5 or its predecessors.

6-1-4. Amplifier Phase Compensation


Vcc
Phase delay
: group delay---advance
AT PB TIME
Vcc
Phase advance
: group delay---delay
AT REC TIME
Advance
G/D(m sec)
0.1
-0.1
1
10
MHz
Delay

※ (NOTE) : The circuit shown above is simplified for clarity.

Fig. 5-74 Phase Compensation Circuit

The signal from the LPF is fed to the phase compensation circuit (which also serves as an amplifier). The phase compensation circuit provides a function which is not found on conventional ICs. The circuit is shown in Fig. 5-74. The direction of phase rotation is reversed between REC and PB. That is, the group delay time is compensated in the direction of "delay" at REC time, whereas it is compensated in the direction of "lead" at PB time. The delay time is about 100 nsec between 200 kHz and 10 MHz. Since this delay polarity is reversed, the time difference between REC and PB becomes 200nsec, or twice the original value.

6-1-2. AGC (HA11725)

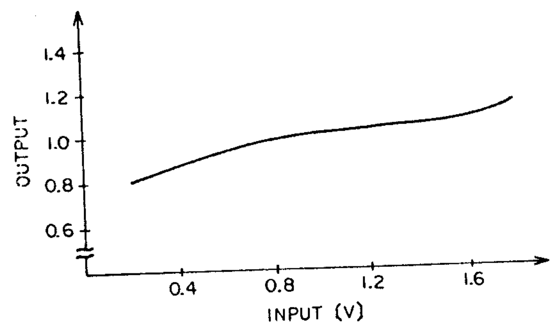


Fig. 5-72 AGC Characteristics

A signal routed to pin ㉖ of HA11725 is then supplied to AGC. The AGC on HA11725 is of the "peak + keyed" type, and is similar to the one employed on HA11701. Its characteristics are shown in Fig. 5-72.
The output level from AGC is varied by VR-7 (pin ㉗), thereby providing deviation adjustment. Additionally, the time constant of AGC is determined by the combined capasitance resistance at pins ㉖ and ②.

6-1-3. Low Pass Filter (LPF)

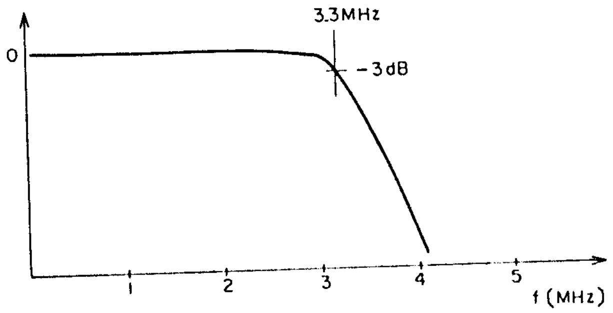
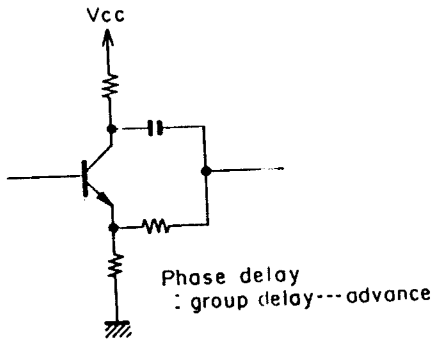


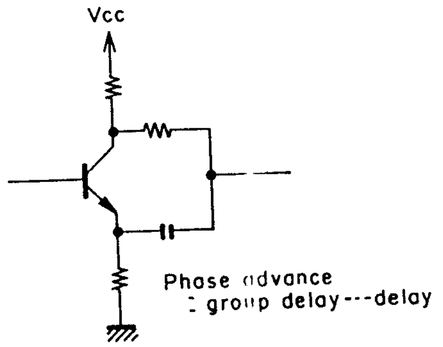
Fig. 5-73 LPF f-Characteristics

A portion of the signal from AGC is supplied to the EE monitor squelch circuit and then routed to pin ⑤ (VIDEO OUT) via EE PB switch.
The remaining (main) portion of the signal goes to LPF, where a chroma signal of 4.43 MHz is removed. On VP-88, the circuit construction is such that LPF is used during both recording and playback operation. This arrangement is different from the one employed on VS-5 in which separate LPFs are used for recording and playback. The VP-88 approach reduces the number of filters in use resulting in reduction of component parts and cost. On the other hand, the VS-5 approach ensures optimum characteristics for both recording and playback, and therefore is considered more ideal. However, with VP-88, particular emphasis is placed on the LPF characteristic for the PB system. The characteristic for recording is also made satisfactory by adding a trap at 4.43 MHz.
The filters employed are a new type, requiring less than half the space formerly required in VS-5 or its predecessors.

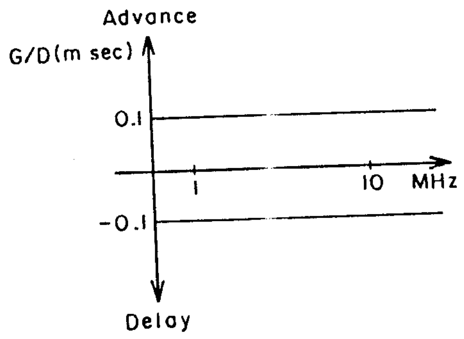
6-1-4. Amplifier Phase Compensation



AT PB TIME



AT REC TIME



※ (NOTE) : The circuit shown above is simplified for clarity.

Fig. 5-74 Phase Compensation Circuit

The signal from the LPF is fed to the phase compensation circuit (which also serves as an amplifier). The phase compensation circuit provides a function which is not found on conventional IC's. The circuit is shown in Fig. 5-74. The direction of phase rotation is reversed between REC and PB. That is, the group delay time is compensated in the direction of "delay" at REC time, whereas it is compensated in the direction of "lead" at PB time. The delay time is about 100 nsec between 200 kHz and 10 MHz. Since this delay polarity is reversed, the time difference between REC and PB becomes 200nsec, or twice the original value.

6-1-5. Clamp/Dynamic Emphasis Circuit

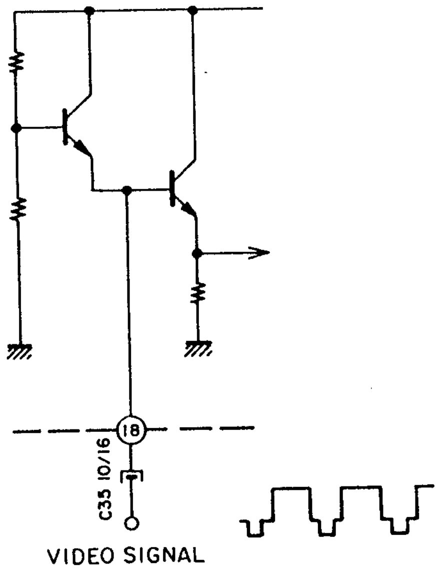


Fig. 5-75 Clamp circuit

The signal from the phase compensation circuit is passed through a 4.43 MHz trap, already described in 6-1-3, and then clamped before being supplied ten clamped before being supplied to the dynamic emphasis circuit.
The clamp used is the "soft" type as shown in Fig. 5-75.
A dynamic emphasis circuit is employed also on VS-9700 and VS-5. It has become customary to use this type of circuit for video signal handling.
Unlike conventional ICs, HA11724 incorporates a dynamic emphasis circuit as an integral part.
Fig. 5-76 shows the dynamic emphasis circuit provided on HA11724. The following describes the basic operating principle of this circuit:
The signal supplied to TR1 is routed to TR2 via R1, while the same signal also goes to TR3 via a low-pass filter consisting of R2, R4 and C1.
Since TR2 and TR3 constitute a differential amplifier, the frequency characteristic is affected by any difference in input between TR2 and TR3.
If the input, or TR2/TR3 output, is small, then D1 and D2 will not be conducting, and the frequency characteristic is determined purely by a filter made up of R2, R4 and C1.
However, as the input increases, the output also increases, causing D1 and D2 to conduct. D1 and D2 short the TR2/TR3 outputs via R5, and therefore the gain of the differential amplifier (TR2 + TR3) drops.
This results in the emphasis at high frequencies being reduced when compared with the emphasis at times when the input level is small. Fig. 5-77 shows the dynamic emphasis characteristic of HA11724.

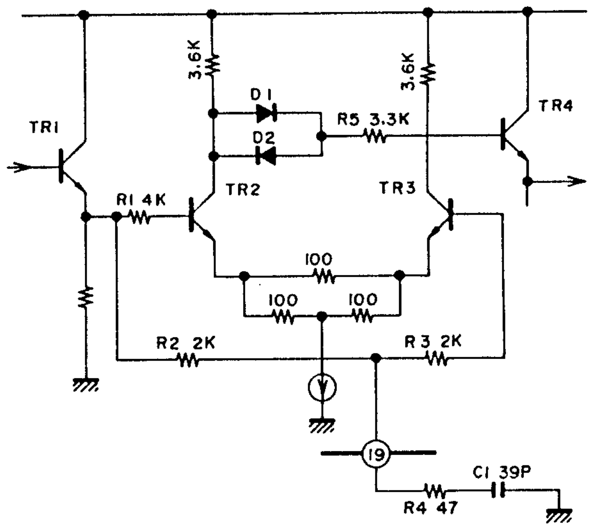


Fig. 5-76 Dynamic Emphasis Circuit

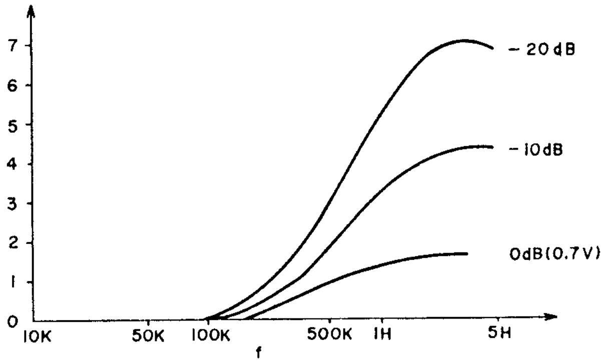
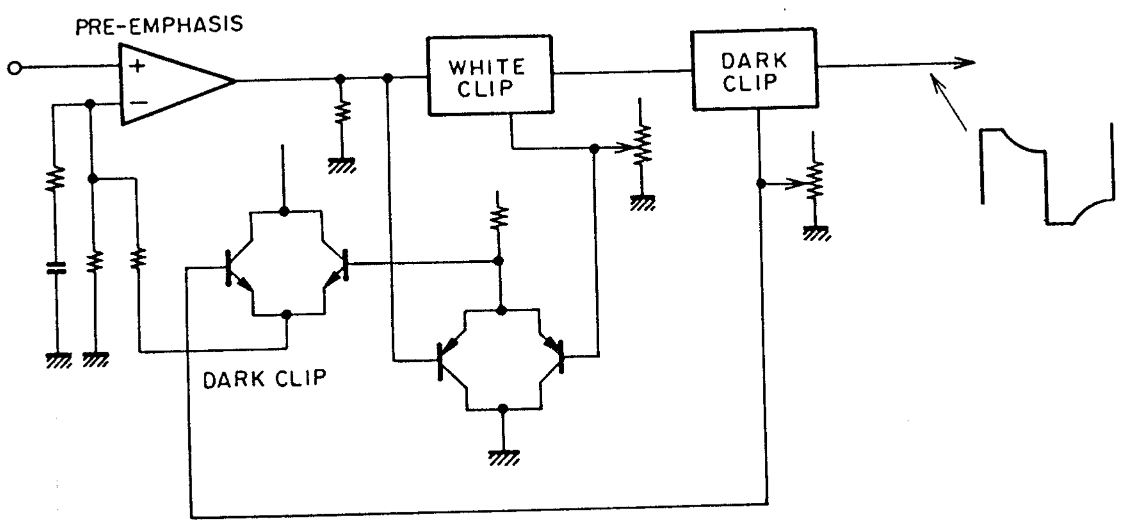


Fig. 5-77 Dynamic Emphasis Characteristics

6-1-6. Main Pre-emphasis, White Clip and Dark Clip Circuits


PRE-EMPHASIS
+
−
WHITE CLIP
DARK CLIP
DARK CLIP

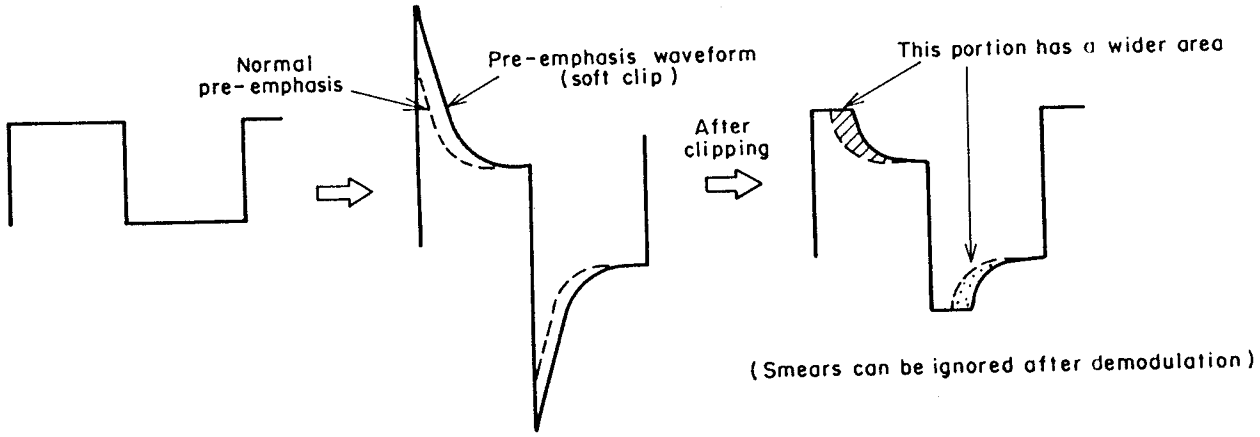

Normal pre-emphasis
Pre-emphasis waveform (soft clip)
After clipping
This portion has a wider area
(Smears can be ignored after demodulation)

Fig. 5-78 Soft Clip Circuit

After leaving the dynamic emphasis circuit, the signal is supplied to the main pre-emphasis circuit, where it is subjected to emphasis of the particular characteristic determined by the VHS format.
Subsequently, the signal is fed to a white clip and then a dark clip circuit. If the signal leaving the pre-emphasis circuit is directly supplied to an FM modulator, the frequency deviation is excessive at the rising or falling edge of the waveform, possibly resulting in black/white inversion, degraded S/N ratio, etc.
To avoid this, the white/dark clip circuit is used to provide for clipping +60% on the white side and −40% on the dark side.

Fig. 5-78 shows the soft clip circuit on VP-88.
With HA11724, the clip output is not made available, therefore a soft clip identical to one such as AN6310 cannot be used. For this reason, a clip circuit is added as illustrated in Fig. 5-78.
This permits implementation of a soft clip circuit which is equivalent to AN6310. With this circuit, subjective effect of smears can be further reduced compared with an ordinary soft clip circuit, by changing the clip points of the clip circuit within the IC and the external clip circuit. Although two sets of clips are incorporated, clip-point adjustments can be made by means of a single VR in the same manner as with an ordinary clip circuit.

6-1-7. FM Modulator

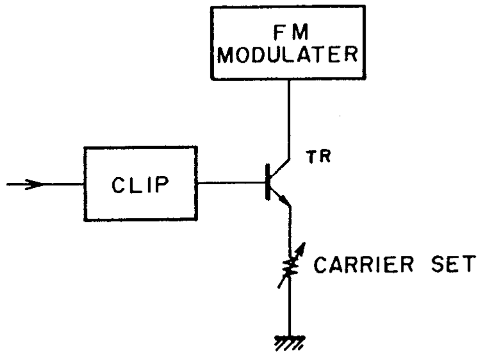

FM MODULATER
CLIP
TR
CARRIER SET

Fig. 5-79 FM Modulator

Employed as an FM modulator is an astable multivibrator of the emitter capacitance coupled type (similar to one employed on HA11701).
The oscillating frequency varies in proportion to the collector current of the transistor (TR) (see Fig. 5-79).

6-1-8. REC Luminance (Y) High Pass Filter (HPF)

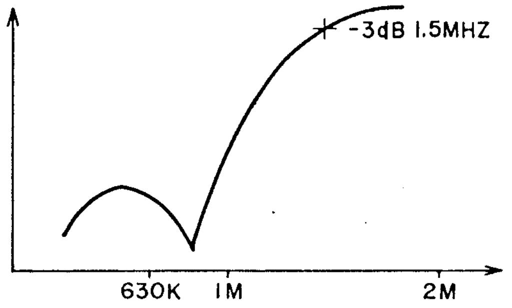


Fig. 5-80 REC Y HPF f-characteristics

The luminance signal that has undergone FM modulation (hence the FM signal) makes a space available for the chroma signal at 630 kHz by using the high pass filter. Since the frequency-characteristic (resolution) of the Y signal is affected, as wide a range as possible is achieved by using a sharp cut-off. (fc = 1.5 MHz)

6-1-9. REC Amplifier

A Class-B Push-Pull circuit is used as the REC amplifier to reduce current consumption.

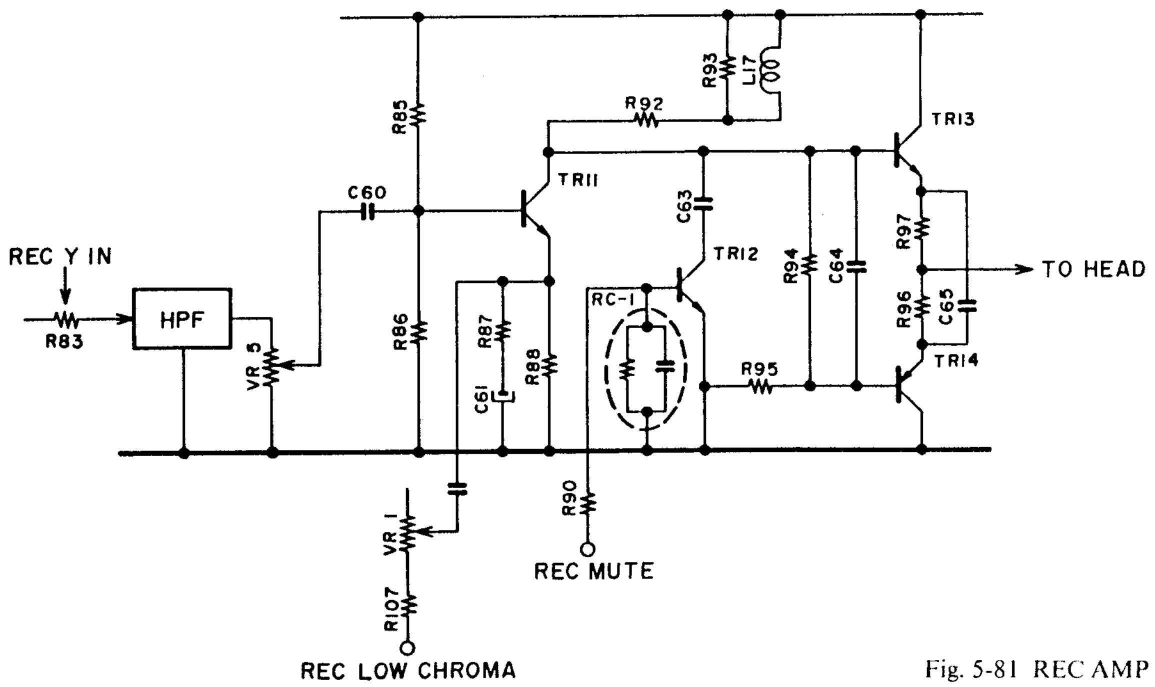

REC Y IN
R83
HPF
VR 5
C60
R85
R86
TR11
R87
C61
R88
R92
R93
L17
C63
TR12
RC-1
R90
REC MUTE
R94
C64
R95
TR13
R97
TO HEAD
R96
C65
TR14
VR 1
R107
REC LOW CHROMA

Fig. 5-81 REC AMP

Fig. 5-81 shows the REC amplifier circuit. The frequency-characteristic of the REC amplifier is determined by R-97, R-96, head's inductance, R-93, L-17 and R-92.
The REC low CHROMA signal is applied to the emitter of TR11. A buffer for the REC amplifier on HA11724 is not in use.

The REC amplifier output is routed to a rotary transformer via the PB/REC change over switch.
As with VS-5, a test point for recording-current measurement is taken from the emitter of the switching transistor, instead of the head amplifier from which it could be affected by the long wire route to the test-point terminal.

6-2. LUMINANCE (Y) PLAYBACK CIRCUIT DESCRIPTION

6-2-1. Pre-amplifier

With VP-88, to eliminate the need for adjustment, the pre-amplifier was designed in such a manner that the amount of peaking at the head amplifier is reduced by adding a peaking amplifier after it.

Thus, peaking attained at the head amplifier is restricted to a factor of 1.3 or so. This is desirable because excessive peaking would make it necessary to adjust the amount of peaking and the peaking frequency by means of a VR and trimmer.

6-2-2. AGC

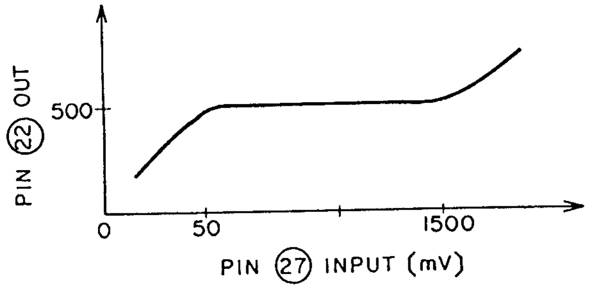


Fig. 5-82 HA11724 AGC characteristics

The signal from the pre-amplifier has its CH-1 and CH-2 components mixed in the MIX amplifier and is then supplied to the AGC amplifier, where a level difference between CH-1 and CH-2 is absorbed.

6-2-3. High Pass Filter (HPF)

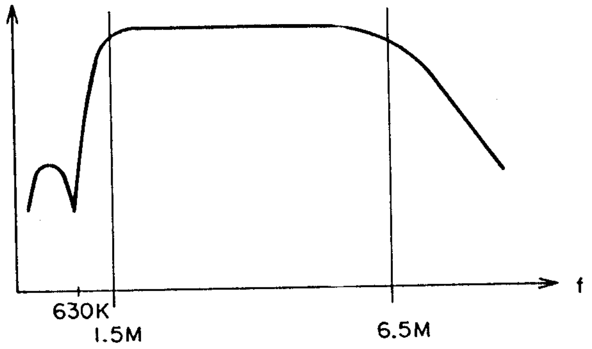


Fig. 5-83 PB HPF + LPF

The purpose of the HPF is to attenuate only the Y component of the PB signal. Normally, an HPF with a cut-off frequency of about 1.4 MHz is employed for this purpose. However, on VP-88, to cope with tape noise between 4 ~ 7 MHz, another low pass filter is incorporated which attenuates frequencies exceeding 5 MHz. This helps to improve S/N by 1 dB or so.

6-2-4. Peaking Amplifier

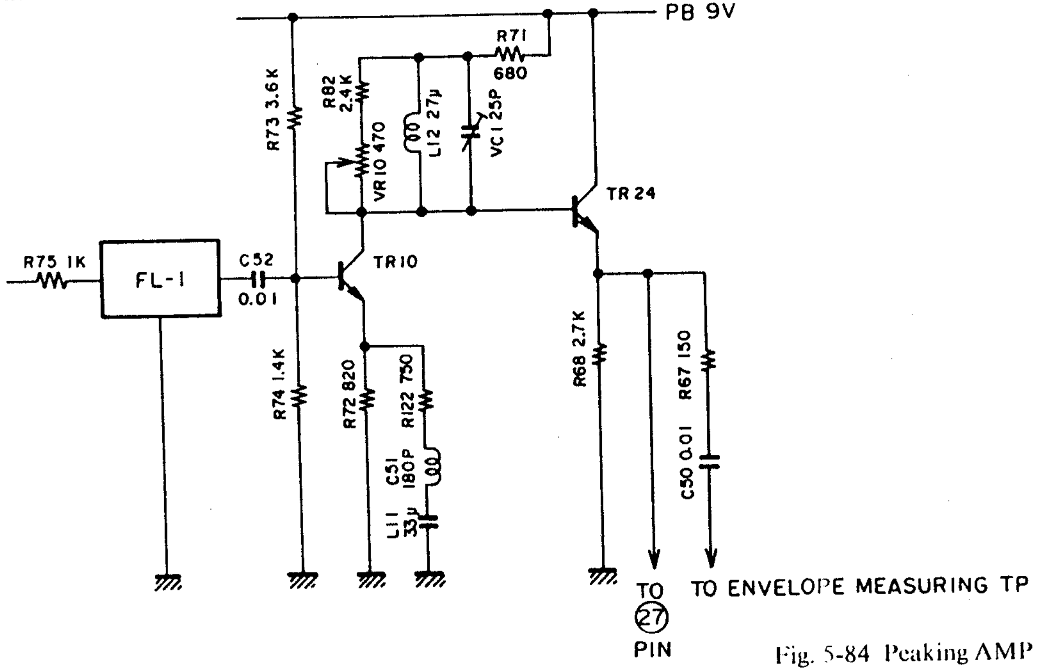


Fig. 5-84 Peaking AMP

The signal from the HPF causes 5 MHz to be subjected to peaking (by a factor of 4 or so) by TR10.

The amount of peaking and the peaking frequency can be varied by means of VR10 and VC-1.

Since TR10 has a considerable gain, the input capacitance increases considerably due to the Miller effect. For this reason, a transistor intended for high frequency operation is employed as TR10.

Also, the purpose of TR24 is to prevent the characteristics of the peaking amplifier from being affected when a probe, etc. is connected to the test points (TP) (TP-8 and P-5's pin 2) for envelope waveform observation.

6-2-5. Drop-Out Compensation (DOC)

After leaving the peaking amplifier, the signal goes to DOC. The delay line used for DOC is very small, there by reducing the PCB area.

6-2-6. Phase Compensation Circuit

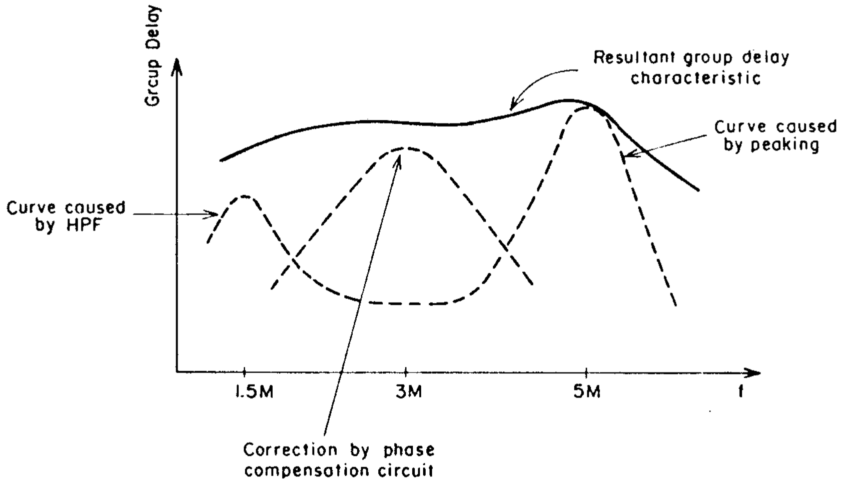


Fig. 5-85 Effect of the Phase Compensation Circuit

When subjected to peaking, the phase characteristic is curved, resulting in improper modulation, distorted edges, or other trouble.

A phase compensation circuit is employed to correct this situation. With VP-88, TR8 is used to provide phase compensation at about 3 MHz.

6-2-7. Double Limiter (1st limiter)

On VS-5, a limiter which is an "L load" and diode limiter combined, is used as a double limiter.

On the other hand, HA11725 has such a circuit built into it inductance "L" for L load is the only external component.

6-2-8. 2nd Limitter and FM Demodulator

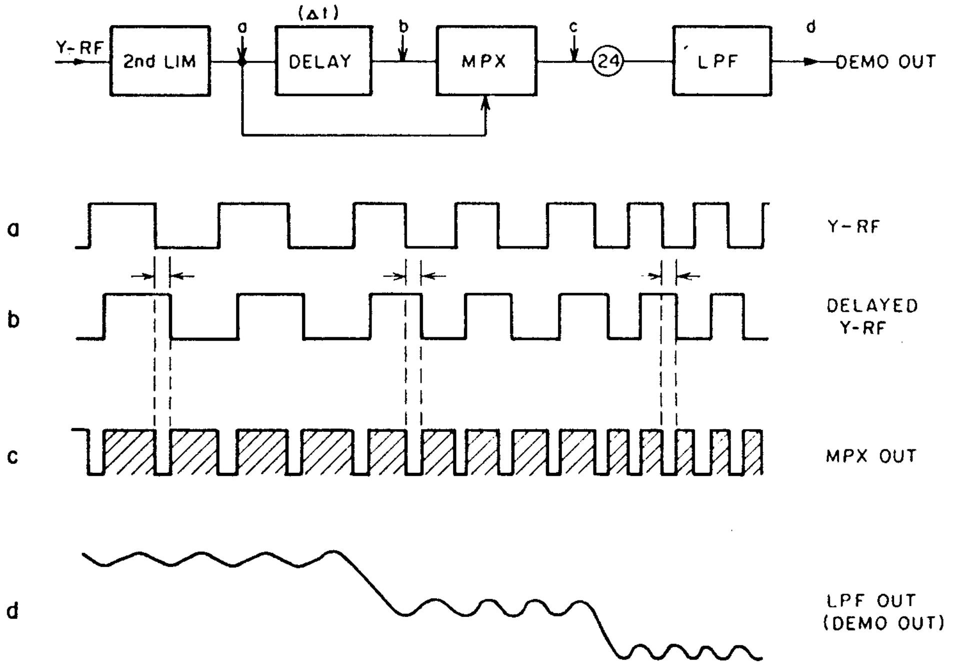


Fig. 5-86 HA11725 FM Demodulator

The signal from the 1st limitter is further passed through the 2nd limitter, and then is supplied to the FM demodulator. As with HA11703 employed on VS-5 or VS-9700, the FM demodulation involves exclusive OR (EXOR) input signal with input delayed by Δ t and obtaining the demodulated signal through a low pass filter.

6-2-9. Low Pass Filter (LPF) (for PB)

To reduce the number of components employed, the same LPF is designed for use during both REC and PB operations. Although use of separate LPF's for REC and PB is of course desirable, satisfactory performance can be obtained by selecting an adequate filter characteristic even if the same filter is used for both REC and PB. (See 6-1-3 "LPF")

6-2-10. De-Emphasis Circuit

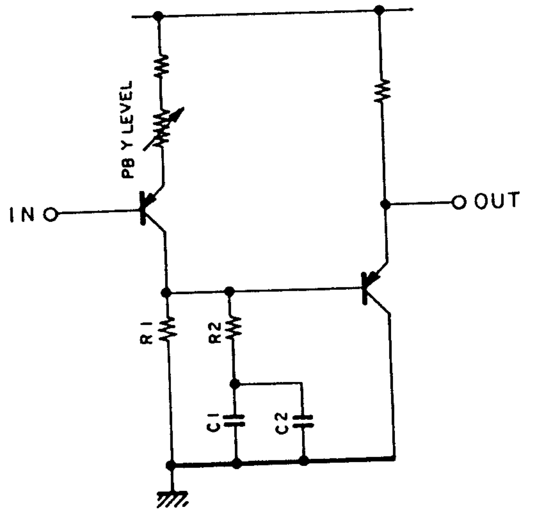


Fig. 5-87 De-emphasis

The de-emphasis circuit employed on VP-88 is almost identical to the one found on VS-5. Fig. 5-87 shows the de-emphasis circuit. Note that the de-emphasis characteristic is determined by R1, R2, and C1 + C2.

6-2-11. Dynamic De-Emphasis Function

This is a new function provided on the new IC.

The necessary de-emphasis characteristic can be obtained from a circuit resembling a dynamic emphasis circuit. With VS-9700 and VS-5, an IC is used which does not incorporate the dynamic emphasis and de-emphasis functions, both of which must therefore be provided externally.

However, since this increases component costs, only a dynamic emphasis circuit of high efficiency was actually adopted on VS-9700 and VS-5.

On the contrary, with HA11725, a dynamic de-emphasis circuit is incorporated and therefore the necessary dynamic de-emphasis characteristic can readily be obtained with the use of C and R (one each).

6-2-12. Noise Cancel Function

The noise cancel circuitry employed is the same as with the conventional HA11703.

Note that while the number of external components is decreased because of an increased integration level of the IC (limited pin number), the degree of freedom to vary the characteristic is reduced.

6-2-13. Phase Compensation Circuit

The signal that has passed the noise cancel circuit is then supplied to the phase compensation circuit.

The phase is rotated in the direction of "lag" to have the delay on "lead" side (just the reverse of what is to be done during REC mode). This facilitates delay time setting by using the same LPF both during REC and PB operations. (See 6-1-4 "Amplifier Phase Compensation")

6-2-14. White Peak Clipper Circuit

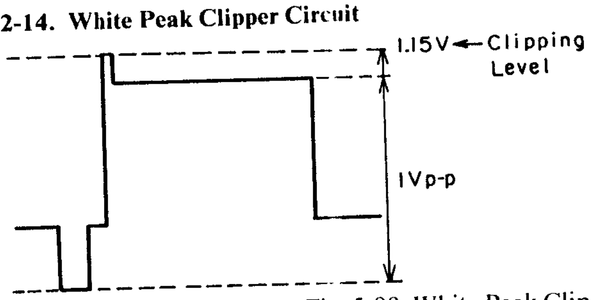


Fig. 5-88 White Peak Clip

The signal from the phase compensation circuit is fed to a white peak clipper, which is a new function implemented on the new IC.

This function permits the peak on the "white" side to be clipped at a 115% to 120% level. (See Fig. 5-88)

If a signal with an extremely high degree of modulation is received because of noise, etc., over-modulation can occur in the RF converter, resulting in buzz being produced. The purpose of this white peak clipper is to suppress an excessive degree of modulation by clipping the white peak.

6-2-15. Squelch Circuit and Y/C MIX

Unlike the squelch circuit on HA11703, the squelch circuit on HA11725 goes to SYNC LEVEL. ("Black" level on HA11703). Thus, the quasi-V signal can be injected at the squelch terminal. However, since the squelch circuit is located ahead of the Y/C MIX circuit on HA11725 there is a chroma signal output even if squelch is effected. For this reason, pin 7 (Y/C MIX terminal) is provided with a transistor switched by quasi-V signal.

6-3. EE CIRCUIT DESCRIPTION

6-3-1. EE Monitor Squelch Circuit

The EE monitor squelch circuit cuts off the monitor output when the input signal falls below a certain level. It functions when "full gain" is reached on AGC as the input level is decreased.

Note that the squelch level is 300mVp-p or less (−10 dB).

6-3-2. Video Amplifier

A Class-B Push-Pull circuit is used as the video amplifier to reduce power consumption.

In addition, an equalizer (EQ) for the RF converter is added because the specification requires that the delay characteristic be about 170nsec at 4.43 MHz. However, equalization is not required with SECAM and System "I" PAL (EK model for U.K.).

Note that this circuit is provided on the chroma PCB.

7. CHROMA SIGNAL SYSTEM

7-1. DESCRIPTION OF THE NEW IC

The VP-88 PAL chroma system is integrated on a single chip (high-density LSI; HA11741), which contains automatic colour, frequency and phase control circuits (ACC, AFC and APC) formerly provided on three different chips.

The use of this LSI together with extensive use of miniature components and efficient circuit design makes it possible to accommodate this chroma signal system for the standard VP-88 (EGN model) in a PCB area less than half that required by VS-5EG.

7-1-1. HA11741 Features

1) The degree of integration is increased from the conventional 3 chips to a single chip.
2) During playback operation, AFC and APC errors are combined and applied only to 160fh VCO. On conventional models, the APC error is applied to 4.435571 MHz VXO, and the AFC error to 160fh VCO.)
3) A colour killer of the phase detection type operates even during REC operation.
4) Correction circuits (e.g., ID pulses) are normally not used.
5) There are two main converters; one for PB and the other for REC.

Fig. 5-89 gives the block diagram of HA11741 as a whole. Fig. 5-90(a) shows the block diagram of the REC system, and Fig. 5-90(c) the block diagram of the PB system.

For comparison, Fig. 5-90(b) gives the block diagram of the REC system, and Fig. 5-90(d) the block diagram of the PB system provided on a conventional 3-chip system (VS-5 with Matsushita's AN6360, AN6371 and AN6362 in use).

7-1-2. Record System Differences

The REC system on VP-88 differs from the one on a conventional model in two ways. (See Fig. 5-90(a), (b))

First, on HA11741, an external crystal oscillator is employed for fixed oscillation of 4.43557 MHz, whereas on the conventional system, a 4.435571 MHz VXO (variable X'tal oscillator) is used as a fixed oscillator.

Second, on HA11741, the phase detector (PD) that activates the REC colour killer operates also with PAL. Therefore the REC colour killer functions even on a VTR that meets the PAL specification (e.g., VP-88).

On the contrary, with the conventional arrangement, the PD for the colour killer is so designed that the burst frequency (input) is compared with the VXO frequency.

With PAL, since the VXO frequency is fs + fh/8 or 4.435571 MHz, and therefore cannot be compared with a burst frequency of 4.433619 MHz, the conventional colour killer will not operate. This makes it necessary to add a circuit externally to determine the presence or absence of the burst.

7-1-3. Playback System Differences

As can be seen from Fig. 5-90(c), (d), the PB system on HA11741 differs greatly from that on the conventional model.

The main difference is that on HA11741, the error voltage of AFC is combined with that of APC to provide control over 160fh VCO and 4.435571 MHz is supplied from a fixed crystal oscillator. In contrast, on the conventional circuitry, 160fh VCO is controlled by AFC, 4.435571 MHz is supplied by VXO, and the APC error is used to provide control.

With HA11741, the AFC and APC errors are applied only to 160fh VCO and therefore it is not easy to set the AFC/APC characteristic freely. In addition, control is provided by 160fh VCO alone, resulting in insufficient gain.

The advantage of the method employed on HA11741 is that a single crystal (3.579545 MHz) can be used for both REC and PB in the case of NTSC.

7-2. CHROMA SIGNAL CIRCUIT DESCRIPTION (RECORD MODE)

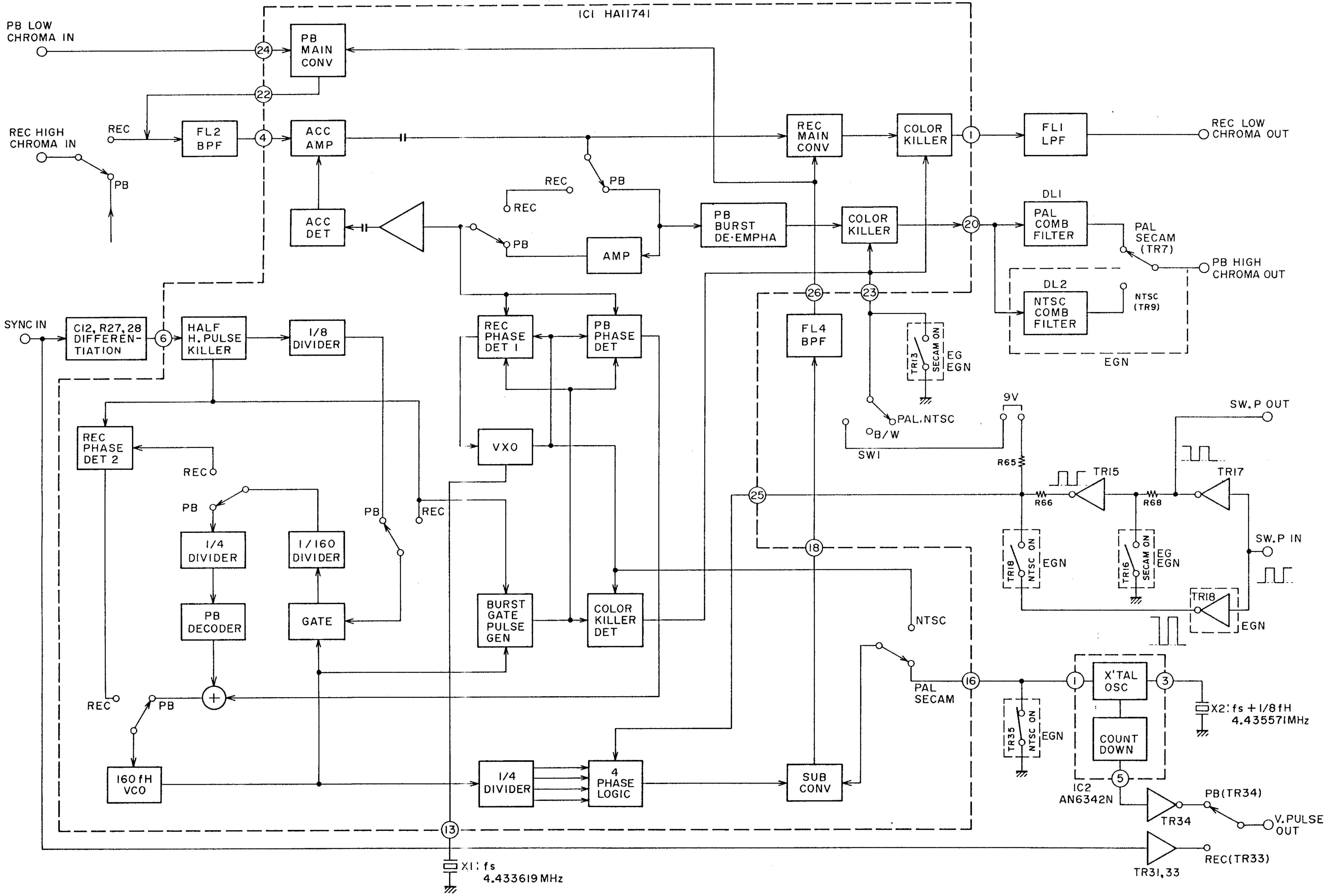

IC1 HA11741
PB LOW CHROMA IN
REC HIGH CHROMA IN
REC
PB
PB MAIN CONV
FL2 BPF
ACC AMP
ACC DET
AMP
REC MAIN CONV
COLOR KILLER
FL1 LPF
REC LOW CHROMA OUT
PB BURST DE·EMPHA
DL1
PAL COMB FILTER
PAL SECAM (TR7)
PB HIGH CHROMA OUT
DL2
NTSC COMB FILTER
NTSC (TR9)
EGN
SYNC IN
C12, R27, 28 DIFFEREN-TIATION
HALF H. PULSE KILLER
1/8 DIVIDER
REC PHASE DET 1
PB PHASE DET
FL4 BPF
TR13
SECAM ON
EG
EGN
PAL.NTSC
B/W
SW1
9V
R65
SW.P OUT
REC PHASE DET 2
VXO
1/4 DIVIDER
1/160 DIVIDER
PB DECODER
GATE
BURST GATE PULSE GEN
COLOR KILLER DET
NTSC
R66
TR15
R68
TR17
TR18
NTSC ON
TR16
SW.P IN
PAL SECAM
X'TAL OSC
COUNT DOWN
IC2 AN6342N
X2: fs + 1/8 fH 4.435571MHz
TR35
160 fH VCO
4 PHASE LOGIC
SUB CONV
PB (TR34)
TR34
V.PULSE OUT
REC (TR33)
TR31, 33
X1: fs 4.433619 MHz
24
22
4
6
1
20
26
23
25
18
16
13
3
5

Fig. 5-89 VR-88 Chroma Block Diagram

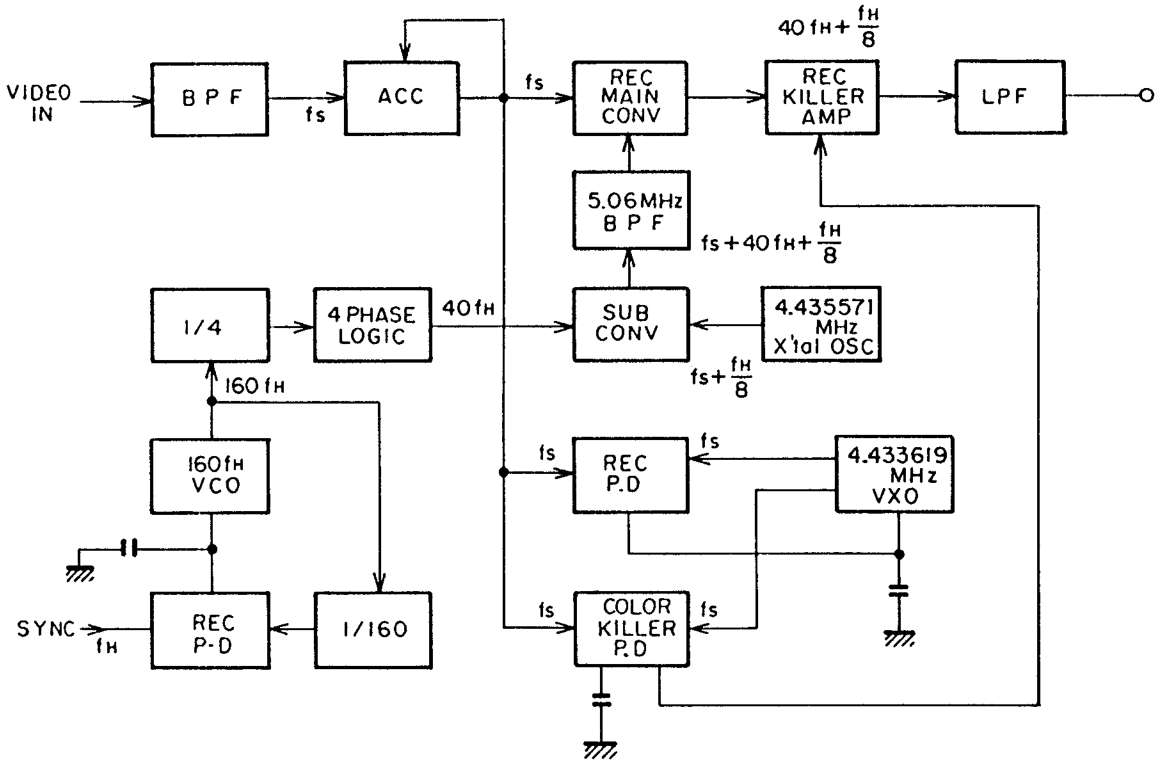

VIDEO IN
BPF
fs
ACC
fs
REC MAIN CONV
40 fH + fH/8
REC KILLER AMP
LPF
5.06MHz BPF
fs+40fH+fH/8
1/4
4 PHASE LOGIC
40fH
SUB CONV
4.435571 MHz X'tal OSC
fs+fH/8
160 fH
160fH VCO
fs
REC P.D
fs
4.433619 MHz VXO
SYNC
fH
REC P-D
1/160
fs
COLOR KILLER P.D
fs

Fig. 5-90(a) Block Diagram of the REC System on HA11741

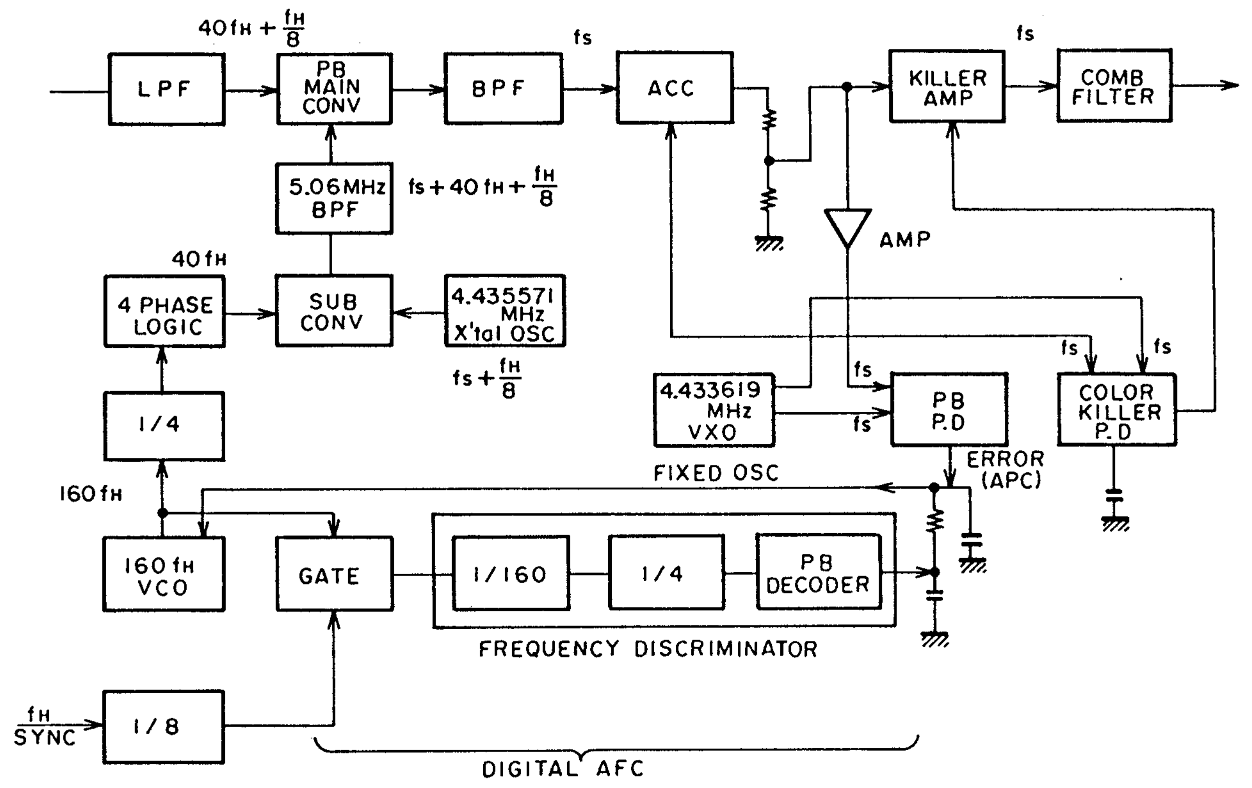

40fH + fH/8
LPF
PB MAIN CONV
BPF
fs
ACC
fs
KILLER AMP
COMB FILTER
5.06MHz BPF
fs+40fH+fH/8
AMP
40fH
4 PHASE LOGIC
SUB CONV
4.435571 MHz X'tal OSC
fs+fH/8
fs
fs
1/4
4.433619 MHz VXO
fs
fs
PB P.D
COLOR KILLER P.D
ERROR (APC)
FIXED OSC
160fH
160fH VCO
GATE
1/160
1/4
PB DECODER
FREQUENCY DISCRIMINATOR
fH
SYNC
1/8
DIGITAL AFC

Fig. 5-90(c) Block Diagram of the PB System on HA11741

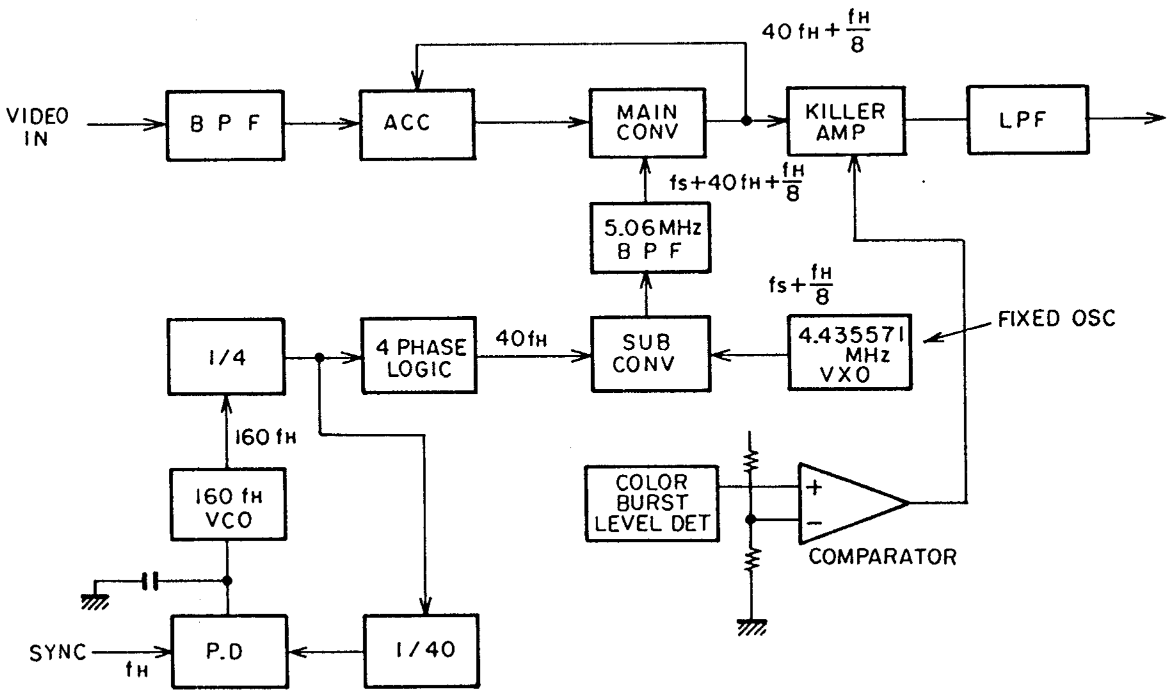

40 fH + fH/8
VIDEO IN
BPF
ACC
MAIN CONV
KILLER AMP
LPF
fs+40fH+fH/8
5.06MHz BPF
fs+fH/8
1/4
4 PHASE LOGIC
40fH
SUB CONV
4.435571 MHz VXO
FIXED OSC
160 fH
160 fH VCO
COLOR BURST LEVEL DET
+
−
COMPARATOR
SYNC
fH
P.D
1/40

Fig. 5-90(b) Block Diagram of the REC System on a Conventional 3-Chip System

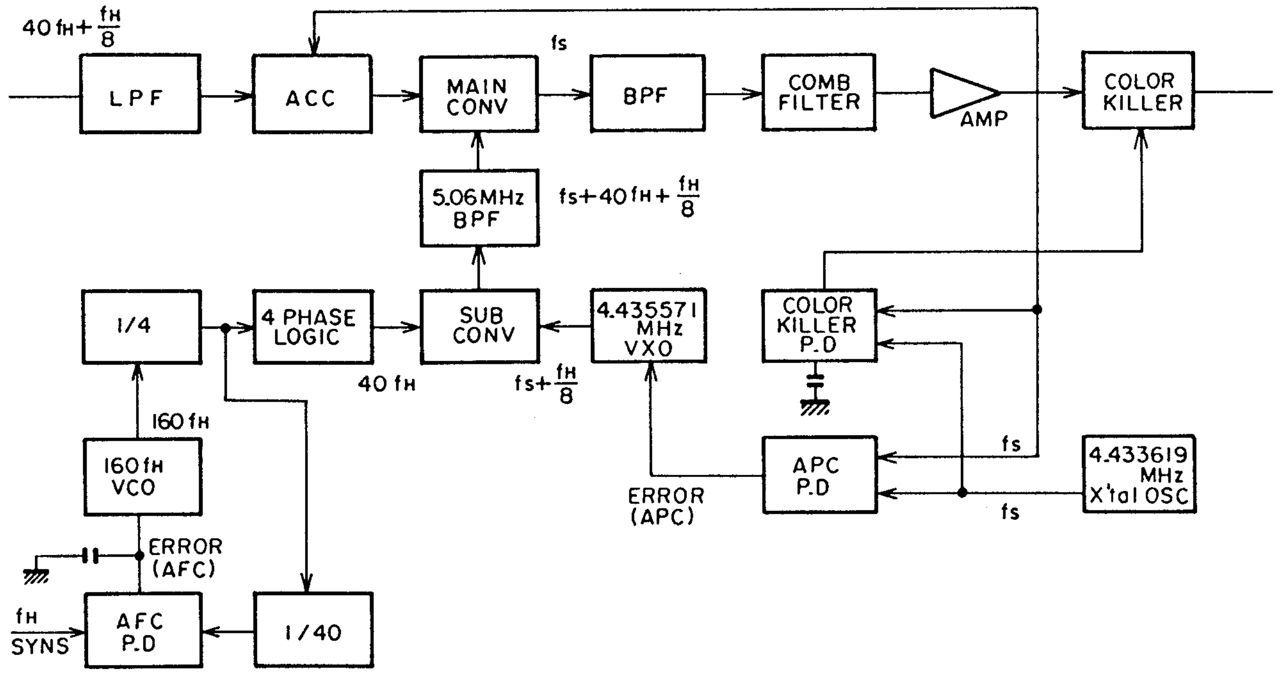

40fH+fH/8
fs
LPF
ACC
MAIN CONV
BPF
COMB FILTER
AMP
COLOR KILLER
5.06MHz BPF
fs+40fH+fH/8
1/4
4 PHASE LOGIC
SUB CONV
4.435571 MHz VXO
COLOR KILLER P.D
40 fH
fs+fH/8
160fH
160fH VCO
ERROR (APC)
APC P.D
fs
fs
4.433619 MHz X'tal OSC
ERROR (AFC)
fH
SYNS
AFC P.D
1/40

Fig. 5-90(d) Block Diagram of the PB System on a Conventional 3-Chip System

7-2-1. REC/PB Switching and 4.43 MHz Band Pass Filter (BPF)

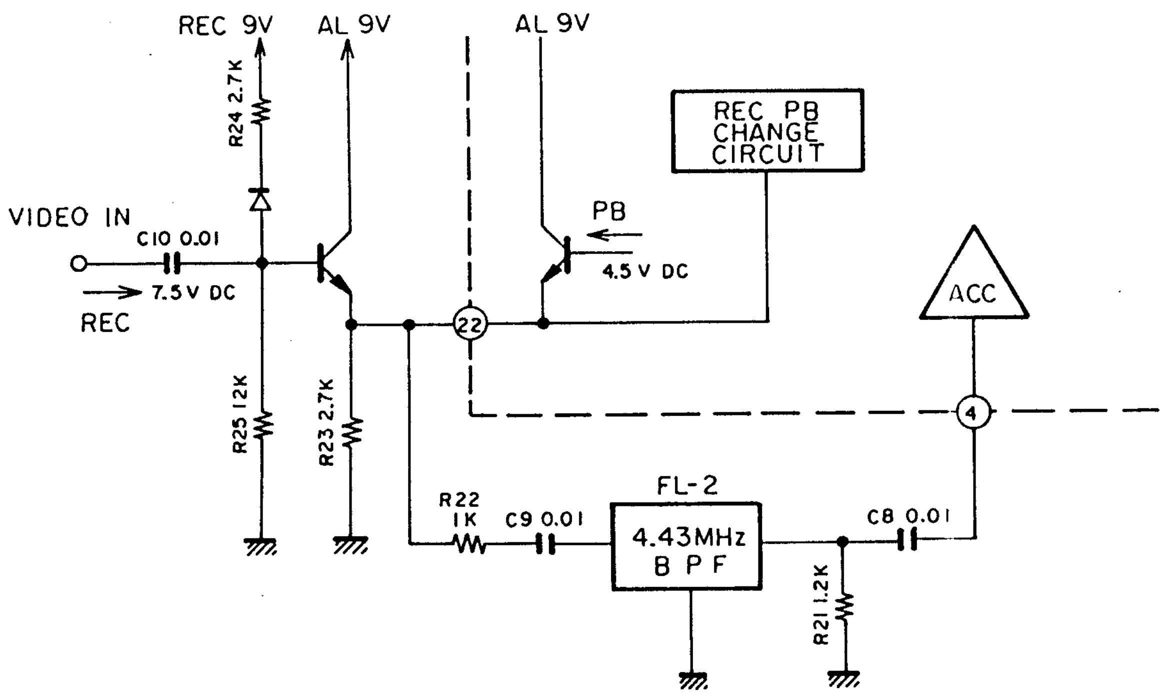

REC 9V
AL 9V
AL 9V
R24 2.7K
VIDEO IN
C10 0.01
7.5V DC
REC
REC PB CHANGE CIRCUIT
PB
4.5 V DC
ACC
22
4
R25 12K
R23 2.7K
R22 1K
C9 0.01
FL-2
4.43MHz B P F
C8 0.01
R21 1.2K

Fig. 5-91 REC/PB Switching, 4.43 MHz B.P.F

The signal VIDEO IN is supplied to the emitter-follower of TR1. This circuit also provides REC/PB switching within HA11741. The signal is then supplied to a 4.43 MHz BPF, where the chroma signal alone is extracted from the video signal. On VP-88, a single 4.43 MHz BPF is used for both recording and playback to achieve reduction in cost and PCB area. This approach makes it imperative to select the BPF characteristics so that they satisfy PB requirements (relatively narrow pass band, sharp cut-off, etc.) These in turn results in somewhat degraded chroma resolution, phase characteristics, etc. when compared with a BPF designed specifically for recording where a rather wide pass band and "straightforward" characteristics are allowed. Practical experiments have verified that such disadvantages can be ignored. Fig. 5-91 shows the associated portion of the circuitry.

7-2-2. ACC Amplifier, Record Mode Main Convertor and Colour Killer

The REC waveform (i.e., the chroma signal from the 4.43 MHz BPF) enters the ACC amplifier where it is controlled to a specific amplitude. The ACC amplifier output appears at pin ②. In addition, within the IC, the ACC output is supplied to the record mode main converter and routed to pin ① via a colour killer. The signal appearing at pin ① is connected through a low pass filter to the record amplifier.

7-2-3. AFC System

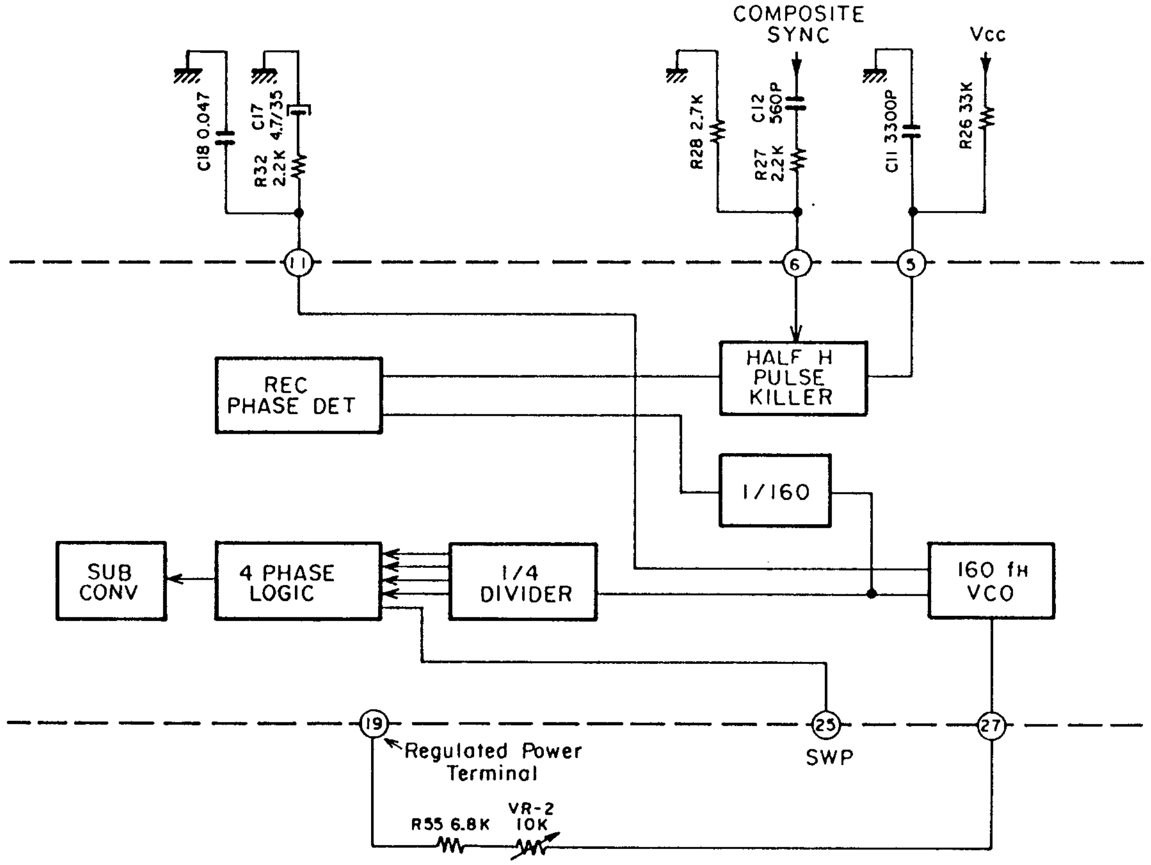

COMPOSITE SYNC
Vcc
C18 0.047
C17 4.7/35
R32 2.2K
R28 2.7K
C12 560P
R27 2.2K
C11 3300P
R26 33K
11
6
5
REC PHASE DET
HALF H PULSE KILLER
1/160
SUB CONV
4 PHASE LOGIC
1/4 DIVIDER
160 fH VCO
19
25
27
Regulated Power Terminal
SWP
R55 6.8K
VR-2 10K

Fig. 5-92 AFC System (REC)

The SYNC pulse from pin ③ of HA11725 is passed to a differentiating circuit which removes the "V" pulse and then enters HA11741 at pin ⑥, and within the IC, it passes through a half-H pulse killer. This cuts off over the suppressed 1/2H interval to prevent disturbance to the AFC circuit. The H SYNC pulse obtained in this manner is used to control the 160fh VCO by counting it down to 1/4 (i.e., 40fh).

The signal then has its Channel 2 phase delayed by 90° in a 4-phase logic circuit before being sent to a sub-converter. Channel 1 phase is not changed.

Fig. 5-92 shows the associatd circuits. The VR at pin ㉗ is for adjusting the operating point of 160fh VCO. The CR components at pin ⑪ serve as a filter for the AFC phase detector, while the CR components at pin ⑥ function as a filter for taking out H SYNC from the composite SYNC. The CR components at pin ⑤ determine the time constant of a mono multivibrator acting as the half-H pulse killer.

The regulated power supply is connected to pin ⑲.

7-

In tl
(CH-
Ther
chan
back
"EG

7-3-4. Automatic Frequency Control (AFC)

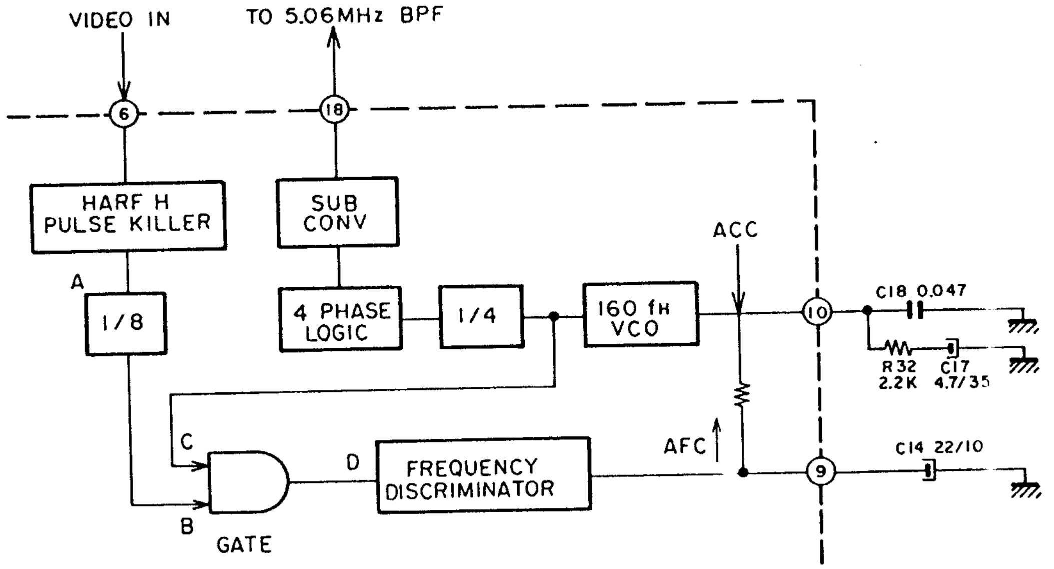

VIDEO IN
TO 5.06MHz BPF
6
18
HARF H
PULSE KILLER
SUB
CONV
ACC
A
1/8
4 PHASE
LOGIC
1/4
160 fH
VCO
10
C18 0.047
R32
2.2K
C17
4.7/35
C
D
FREQUENCY
DISCRIMINATOR
AFC
9
C14 22/10
B
GATE

Fig. 5-101 AFC Circuitry

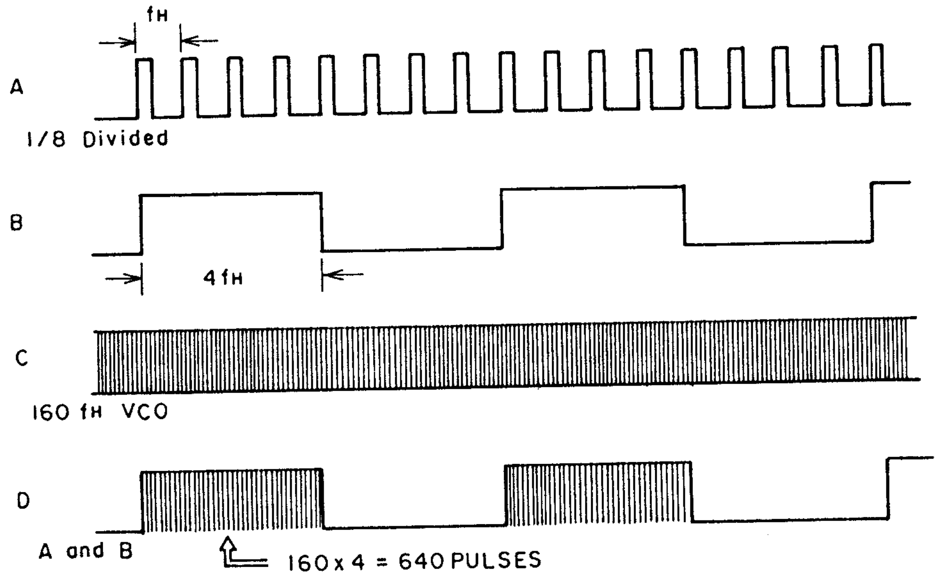

fH
A
1/8 Divided
B
4fH
C
160 fH VCO
D
A and B
160x4 = 640 PULSES

Fig. 5-102 Waveforms involved

The AFC (for the PB system) employed on HA11741 is different from a conventional AFC in that it operates on a "digital" principle. As shown in Fig. 5-101, the H sync from the half-H pulse killer is frequency-divided by a 1/8 divider as illustrated in Fig. 5-102. The resultant waveform is used to "gate" the 160fh VCO output at the gate that follows. If the 160fh VCO is oscillating exactly at 160fh, then 160 × 4 = 640 pulses should be obtained in 4H, while the gate is left open.

If the oscillation frequency of the 160fh VCO fluctuates during power ON or following V Sync or for some other reason, an attempt is made to alter the frequency if the pulse count falls below 638 or rises above 642 relative to the 640 standard pulse count. For example 164fh gives 164 × 4 = 656 pulses.

In other words, the 160fh VCO error is controlled to ±1/2fh. This control operation is performed by a frequency discriminator connected after the gate, which acts as a type of digital comparator.

7-3-5. Automatic Phase Control (APC)

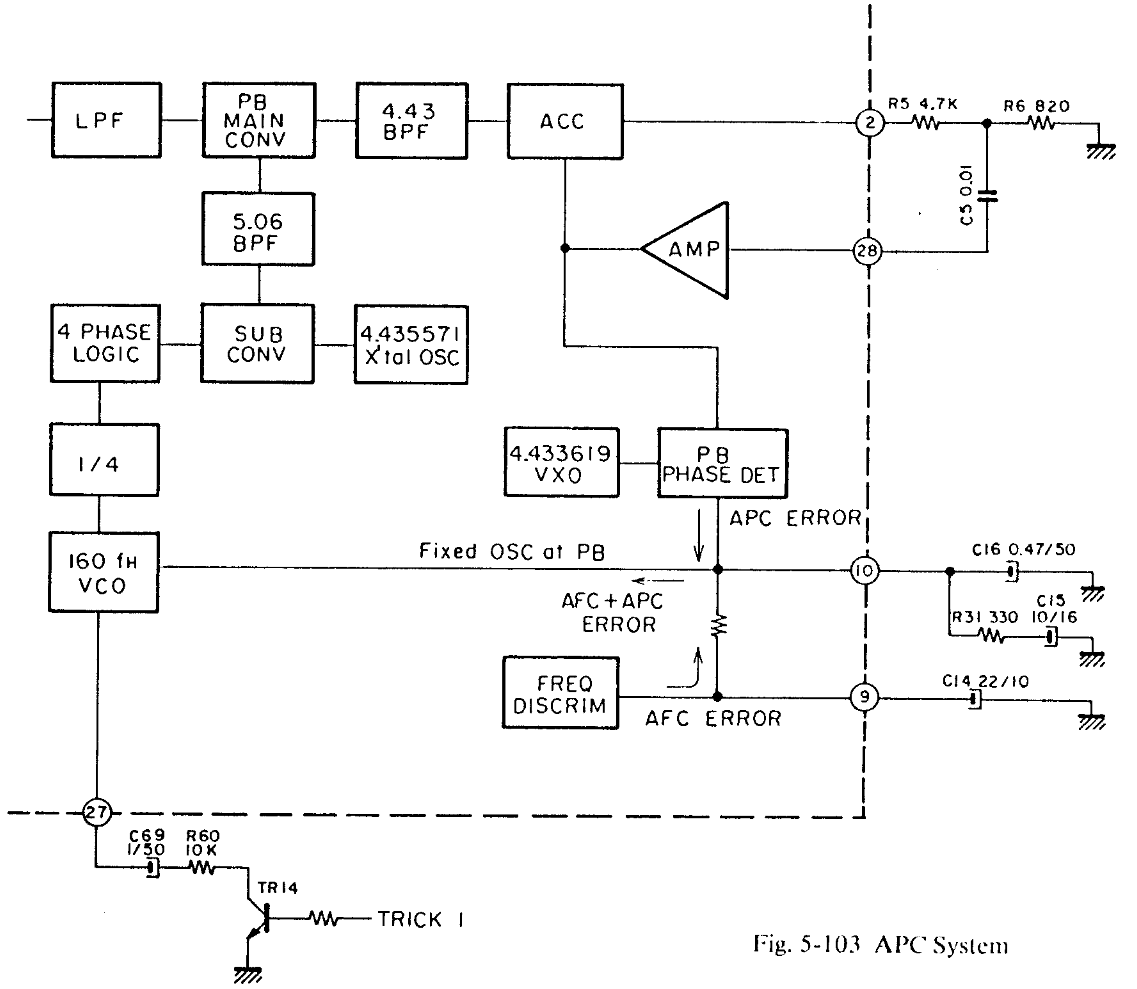

LPF
PB
MAIN
CONV
4.43
BPF
ACC
2
R5 4.7K
R6 820
C5 0.01
5.06
BPF
AMP
28
4 PHASE
LOGIC
SUB
CONV
4.435571
X'tal OSC
1/4
4.433619
VXO
PB
PHASE DET
APC ERROR
160 fH
VCO
Fixed OSC at PB
AFC+APC
ERROR
10
C16 0.47/50
R31 330
C15
10/16
FREQ
DISCRIM
AFC ERROR
9
C14 22/10
27
C69
1/50
R60
10K
TR14
TRICK I

Fig. 5-103 APC System

On HA11741, APC is also different from the conventional design, since it is made to function by controlling the 160fh VCO. Fig. 5-103 shows the operating loop. With the 4.433619 MHz VXO (fixed oscillation during PB) being used as a referenc signal, the signal has its phase compared with that of the burst portion of the PB chroma signal and the error causes the signal to be routed to 160fh VCO, SUB-CONVERTOR, MAIN CONVERTOR, PB Phase Detector and then to 160fh VCO.

ACC is normally followed by a comb filter to remove crosstalk. Use of a comb filter in that position causes a delay of 2H, which in turn results in a delay in APC control. This normally poses no problem. However, with HA11741, because the APC system has low gain and therefore APC control is not so efficient, reduced control capability due to this delay cannot be ignored. To overcome this situation, resistances are used in that particular location in place of a comb filter, to provide a loss equal to the comb filter loss.

C69 and R60 connected to pin 27 increase the sensitivity of the 160fh VCO. When they are activated by switch TR14, the sensitivity of the 160fh VCO is increased, resulting in improved APC control capability. However, since increasing the sensitivity causes hunting in the APC system, resulting in somewhat degraded picture quality, the operation must only be performed during special modes (CUE, REVIEW, SLOW or STILL), where the APC system needs to be stabilized.

7-3-6. Comb Filter

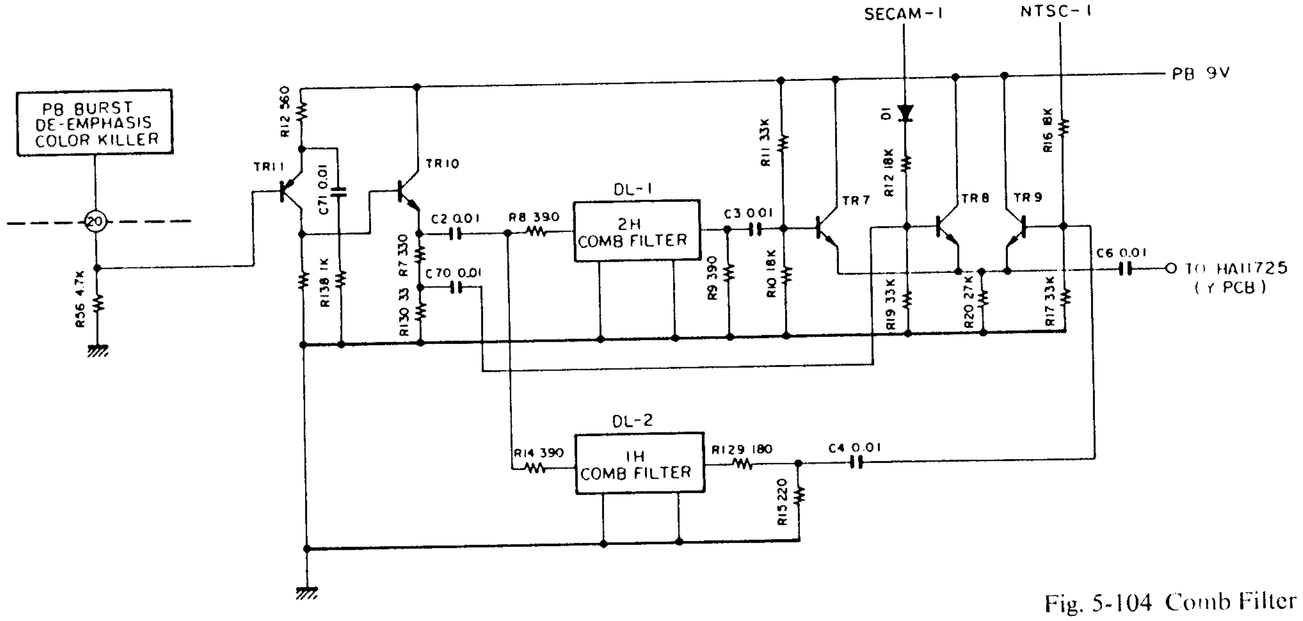

SECAM-1
NTSC-1
PB 9V
PB BURST
DE-EMPHASIS
COLOR KILLER
20
R56 4.7K
TR11
R12 560
C71 0.01
R138 1K
TR10
R7 330
R130 33
C2 0.01
C70 0.01
R8 390
DL-1
2H
COMB FILTER
C3 0.01
R9 390
R10 18K
R11 33K
TR7
D1
R12 18K
R19 33K
TR8
R20 27K
TR9
R16 18K
R17 33K
C6 0.01
TO HA11725
(Y PCB)
DL-2
R14 390
1H
COMB FILTER
R129 180
R15 220
C4 0.01

Fig. 5-104 Comb Filter

On VP-88, a comb filter is not located in the normal position as already mentioned in 7-3-3. The filter is connected at the end of the chroma system (see Fig. 5-104).

In Fig. 5-104, TR11 is an amplifier, TR10 is a buffer for driving the comb filter, and TR7, TR8 and TR9 are change-over switches for PAL/SECAM/NTSC.

The circuitry shown in Fig. 5-104 is for the EGN model, and circuitry associated with DL-2 and TR9 is not required with the EG and EK models. Circuitry associated with TR8 also becomes unnecessary for the EK model.

During normal playback (PAL playback), the chroma signal is generated from Video Chroma Playback IC (HA11741) Pin 0 , amplified in TR11, and fed via Emitter Follower of TR10 into DL1's 2H delay line (Comb filter for PAL), where cross talk is eleiminated. (Both TP10 and TP11 are L and, therefore, TR8 and TR9 Cut Off.) The output is obtained at TR7.

During NTSC playback, the chroma signal from Pin 0 passes through TR11, TR10, and DL2's 1H delay line (NTSC comb filter), where cross talk is eliminated. The output is obtained at TR9 buffer.

During NTSC playback, TP11 is H, thus supplying bias to TR9. This causes the emitter voltage at TR9 to be raised. TR7 and TR8, of which emitter voltage becomes higher than the base voltage, is cut off, and thus the signal is not transmitted.

During SECAM playback, TP10 is H, which puts TR8 in operation and cuts off TR7 and TR9. Therefore, the chroma signal enters TR11 and TR10 and is fed directly into the base of TR8 and the emitter of TR8 without passing through DL1. This is because the SECAM signal is not phase-shifted during recording and thus the cross talk elimination by the comb filter during playback is not effective.

VI. MECHANICAL ADJUSTMENT

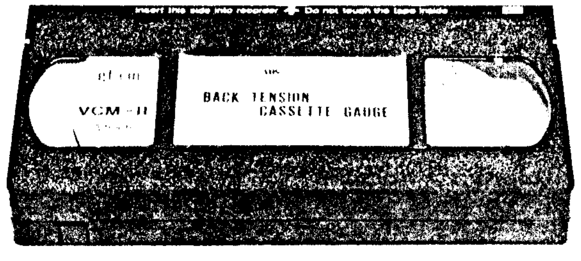
JIGs and TEST TAPEs LIST

Following Jigs and Test Tapes are necessary for proper adjustment.

NEW PARTS NO.	DESCRIPTION	OLD PARTS NO.
AJ-751181	Back Tension Jig	BT-001
AJ-751200	Torque Gauge Head	TM-001
AJ-751224	Torque Gauge (600-ATG)	TM-002
AJ-751231	Extension Cable 15P (VP-88)	
AJ-751232	Extension Cable 9P (VP-88)	
AT-750795	Test Tape Video Reference (PAL/SECAM)	TF-508RF
AT-750796	Test Tape Video Reference (NTSC)	TF-509RF
AT-750797	Test Tape Video Color Bar (PAL)	TF-510CB
AT-750798	Test Tape Video Color Bar (NTSC)	TF-511CB
AT-750800	Test Tape Video W & F (PAL/SECAM)	TF-513LS
AT-750802	Test Tape Video RF Sweep (PAL/SECAM)	TF-515SW

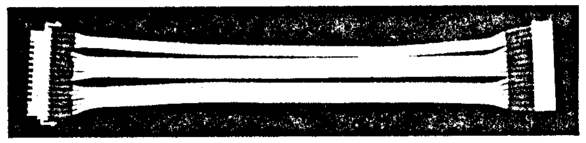
Chart 1

Back Tension Jig


BACK TENSION
CASSETTE GAUGE

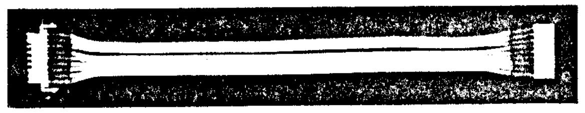
AJ-751181

Extension Cable (VP-88)



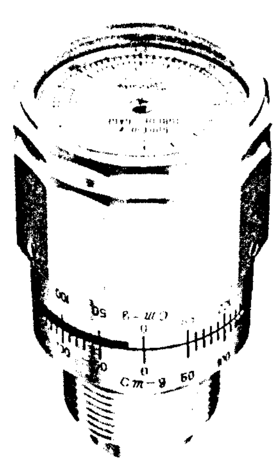
AJ-751231

Extension Cable (VP-88)



AJ-751232

Torque Gauge (600-ATG)



AJ-751224

Torque Gauge Head

AJ-751200

1. TEST MODE SETTING

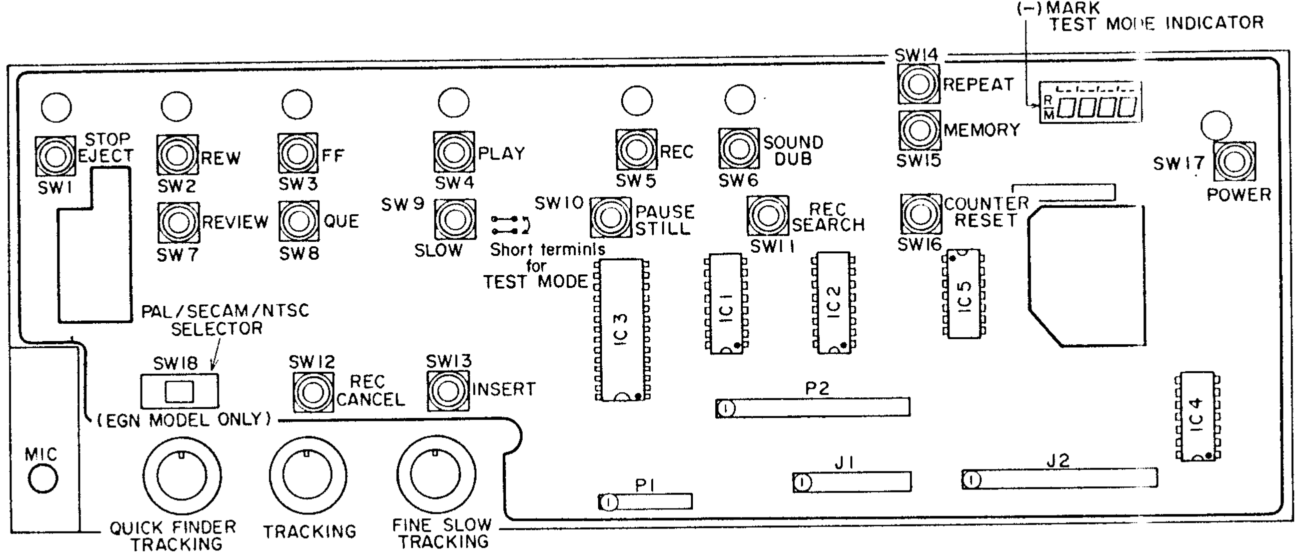

(–) MARK
TEST MODE INDICATOR
SW14
REPEAT
MEMORY
SW15
STOP EJECT
SW1
REW
SW2
FF
SW3
PLAY
SW4
REC
SW5
SOUND DUB
SW6
SW17
POWER
REVIEW
SW7
QUE
SW8
SW9
SLOW
SW10
PAUSE STILL
Short terminls for TEST MODE
REC SEARCH
SW11
COUNTER RESET
SW16
IC3
IC1
IC2
IC5
PAL/SECAM/NTSC SELECTOR
SW18
SW12
REC CANCEL
SW13
INSERT
P2
IC4
(EGN MODEL ONLY)
MIC
P1
J1
J2
QUICK FINDER TRACKING
TRACKING
FINE SLOW TRACKING

Fig. 6-1 VP-88 Front Side (Display PCB)

1) In the mechanical adjustment, tape transport adjustment and electrical adjustment, if the jumper wires located to the right of the SLOW switch on the Display PCB (see Fig. 6-1) are shorted once, the end sensor and take-up sensor functions are cancelled, permitting operation to be performed in each mode without having to set the cassette pack on the VTR.
2) When the test mode is established, the "–" mark is displayed in the leftmost portion of the tape counter as shown in Fig. 6-2.
3) The test mode can be cancelled by shorting the "short terminals" once again.

2. GUIDE POLE (SUPPLY) HEIGHT ADJUSTMENT

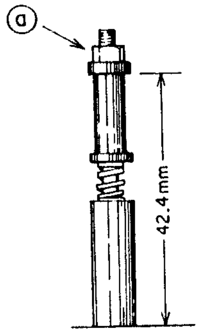


Fig. 6-2 Guide Pole (S)

Adjust a nut ⓐ so that the distance mecha frame to the upper end of the portion on the guide pole (S) on which tape runs is 42.4 mm. (See Fig. 6-2)

3. GUIDE POLE (TAKE-UP) HEIGHT ADJUSTMENT

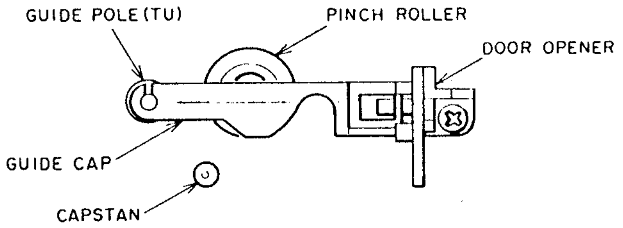

GUIDE POLE (TU)
PINCH ROLLER
DOOR OPENER
GUIDE CAP
CAPSTAN

Fig. 6-3

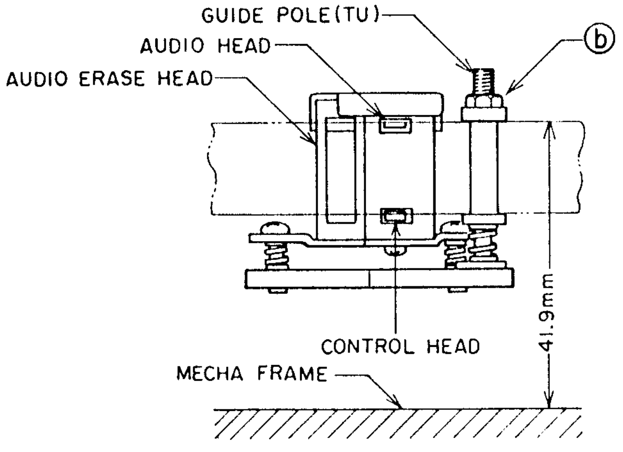

GUIDE POLE (TU)
AUDIO HEAD
AUDIO ERASE HEAD
ⓑ
CONTROL HEAD
MECHA FRAME
41.9mm

Fig. 6-4

1) Remove the guide cap. (See Fig. 6-3)
2) Adjust a nut ⓑ so that the distance from the mecha frame to the upper end of the portion on the guide pole (TU) on which the tape runs is 41.9 mm, as shown in Fig. 6-4.

4. BACK TENSION ADJUSTMENT (Fig. 6-5)

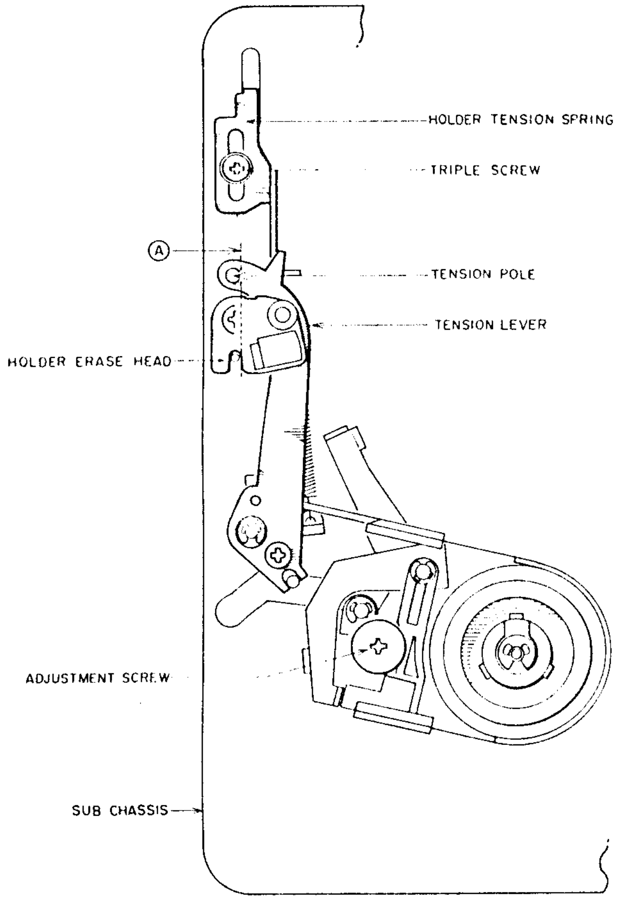

HOLDER TENSION SPRING
TRIPLE SCREW
Ⓐ
TENSION POLE
TENSION LEVER
HOLDER ERASE HEAD
ADJUSTMENT SCREW
SUB CHASSIS

Fig. 6-5

1) Select the playback mode.
2) Turn the adjustment screw clockwise until the tension lever strikes the sub-chassis.
3) Turn the adjustment screw counterclockwise so that the rightmost point on the tension pole is aligned with point Ⓐ.
4) Depress the stop button for unloading.
5) Repeat the steps 1. – 4. above several times.
6) Set the back tension adjustment jig (AJ-751181), and then play.
7) Verify that the reading on the back tension adjustment jig is 20 – 23 g.cm.
8) If the reading in 7. is not within the specified range, loosen the triple screw and adjust the position of the holder tension spring.
9) Paint-lock the screw when the adjustment is complete.

5. TAPE TRANSPORT CHECKING

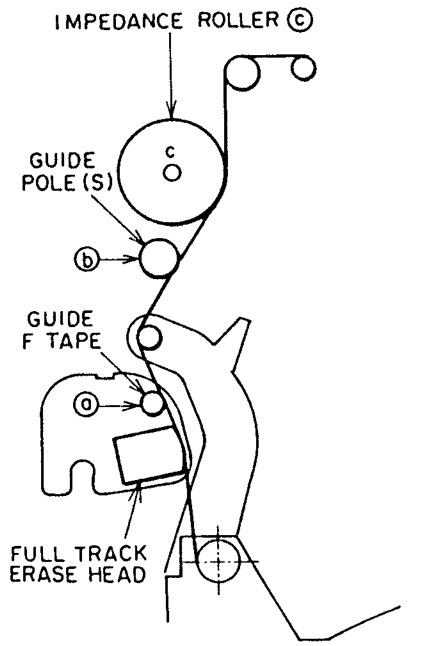

IMPEDANCE ROLLER ©
c
GUIDE POLE (S)
ⓑ
GUIDE F TAPE
ⓐ
FULL TRACK ERASE HEAD

Fig. 6-6

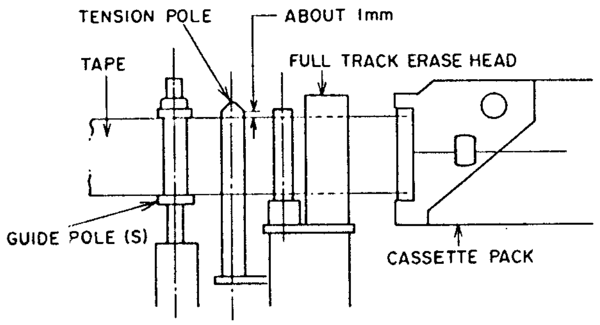

TENSION POLE
ABOUT 1mm
TAPE
FULL TRACK ERASE HEAD
GUIDE POLE (S)
CASSETTE PACK

Fig. 6-7

1) Set the E-180 cassette.
2) Wind the tape up to the tape end with Fast Forward.
3) Rewind the tape slightly and then play.
4) Make certain that the tape is in contact with ⓐ, ⓑ, and ©. (See Fig. 6-6)
5) Check to see that the top of the tension pole is about 1 mm above the upper edge of the tape. (See Fig. 6-7)

6. LOADING GEAR ADJUSTMENT (Fig. 6-8)

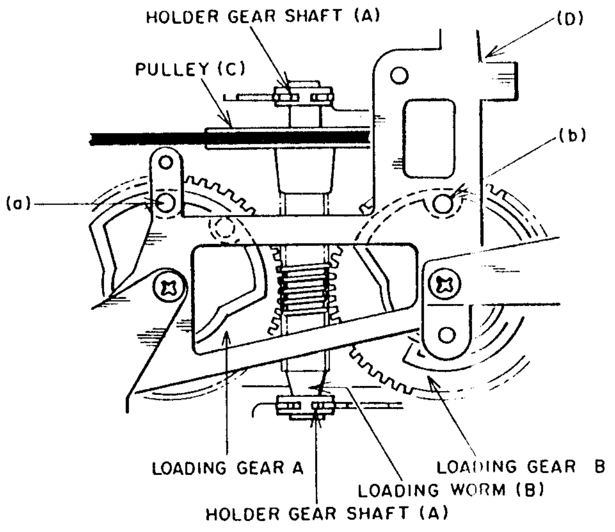

HOLDER GEAR SHAFT (A)
(D)
PULLEY (C)
(b)
(a)
LOADING GEAR A
LOADING GEAR B
LOADING WORM (B)
HOLDER GEAR SHAFT (A)

Fig. 6-8

1) If the loading gear, loading arm, etc. is replaced, it is necessary to adjust the timing of the loading gears.
2) Remove the holder gear shaft (A) and lift the loading worm gear.
3) Turn the loading gears A and B so that the holes in the loading gears (a) and (b) coincide with the corresponding holes in the plate (D).
4) Replace the loading worm gear and holder gear shaft.
5) Turning the pulley (C), verify that the holes (a) and (b) coincide with the holes in the plate (D).

7. HOW TO MOUNT THE ROTARY PLATE

(See Fig. 6-9)

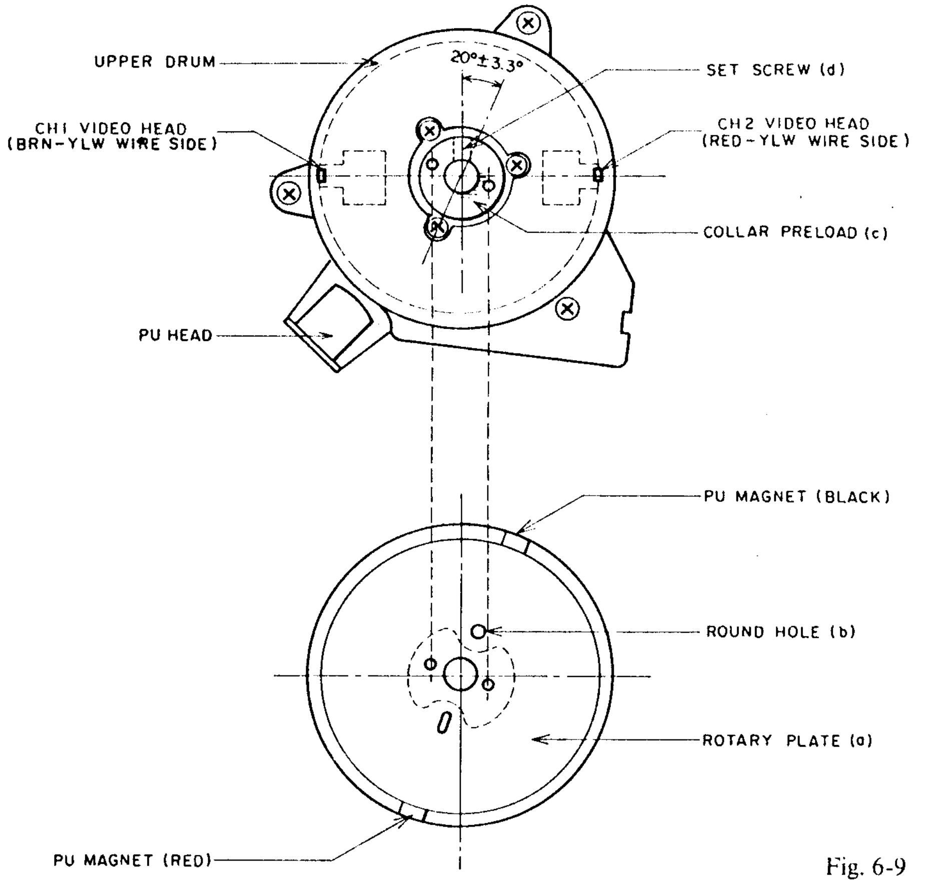

UPPER DRUM
20°±3.3°
SET SCREW (d)
CH1 VIDEO HEAD (BRN-YLW WIRE SIDE)
CH2 VIDEO HEAD (RED-YLW WIRE SIDE)
COLLAR PRELOAD (c)
PU HEAD
PU MAGNET (BLACK)
ROUND HOLE (b)
ROTARY PLATE (a)
PU MAGNET (RED)

Fig. 6-9

When mounting the rotary plate on the drum motor, be sure to align the round hole (b) in the rotary plate (a) with the set screw (d) on the collar preload (c) as illustrated above.

Note:
Do not attempt to remove the collar preload (c) on the head assy. If removed, a special jig is needed for reinstallation, which almost always requires replacement of the drum assy.

8. CHECKING VARIOUS TORQUES

MEASURING ITEM	MODE	MEASURING POINT	RESULT
Loading Torque	STOP PB	Take-up Reel Supply Reel	30 to 100 g·cm 20 to 80 g·cm
PLAY Torque	PB	Take-up Reel	80 to 180 g·cm
FF Torque	FF	Take-up Reel	More than 400 g·cm
RWD Torque	RWD	Supply Reel	More than 400 g·cm
PB Cue Torque	PB Cue	Take-up Reel	80 to 180 g·cm
PB Review Torque	PB REV	Supply Reel	200 to 360 g·cm
Unloading Torque	PB STOP	Supply Reel	80 to 180 g·cm
Brake Torque	STOP	Take-up Reel Supply Reel	More than 200 g·cm

Notes:
1) Putting the set in the test mode by shorting the test terminals on the Display PCB permits torque measurement to be made in each mode without setting the cassette pack.
2) The Torque Meter 600-ATG (AJ-751224) fitted with the Torque Meter Head (AJ-751200) is used to make the measurement in each mode on the take-up reel table and supply reel table.

VII. TAPE TRANSPORT ADJUSTMENT

1. ADJUSTMENT AT NORMAL SPEED

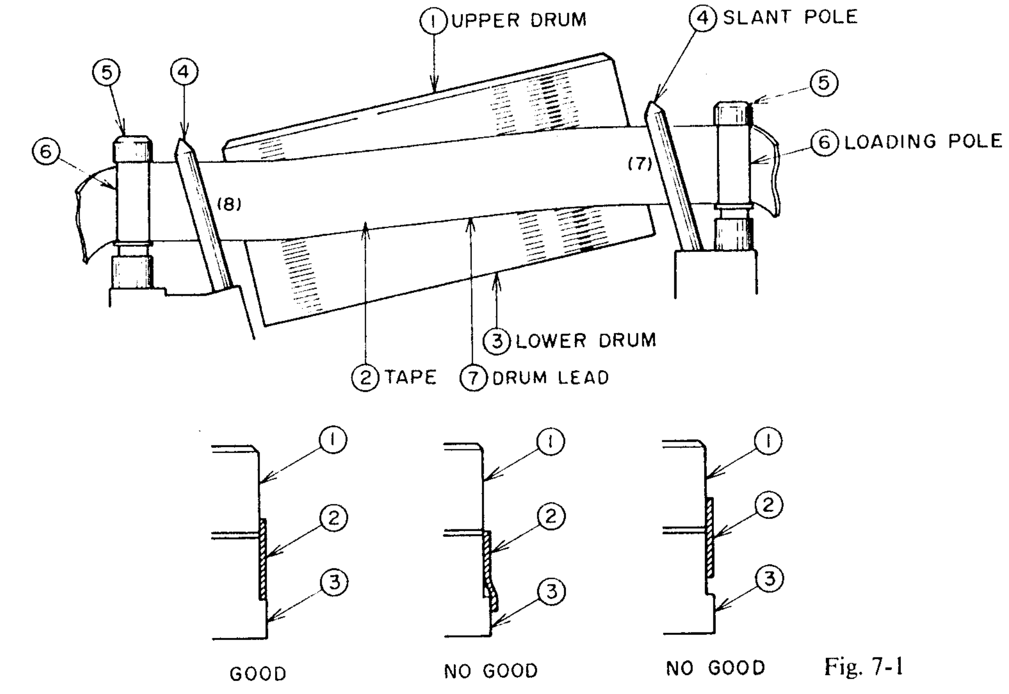

①UPPER DRUM
④SLANT POLE
⑤
④
⑤
⑥
⑥LOADING POLE
(8)
(7)
②TAPE
③LOWER DRUM
⑦DRUM LEAD
①
②
③
GOOD
NO GOOD
NO GOOD

Fig. 7-1

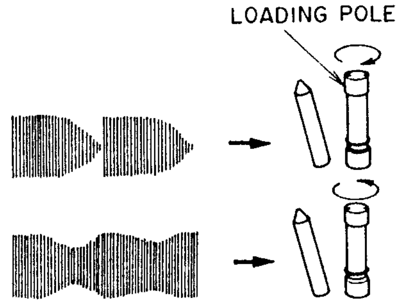

LOADING POLE

Fig. 7-2

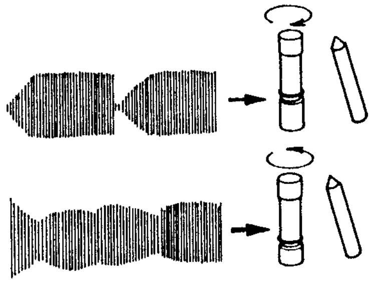


Fig. 7-3

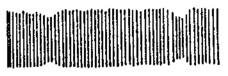


Fig. 7-4

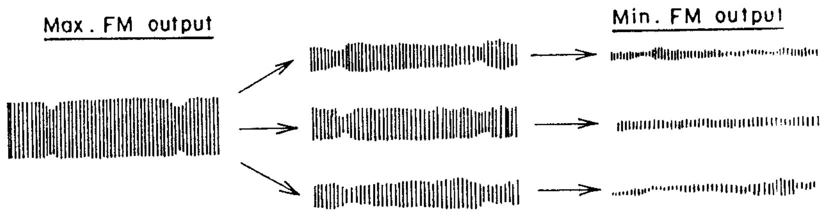


Fig. 7-5

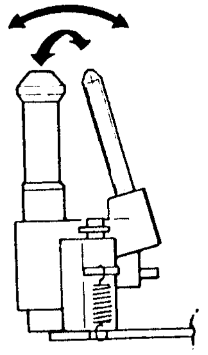


Fig. 7-6

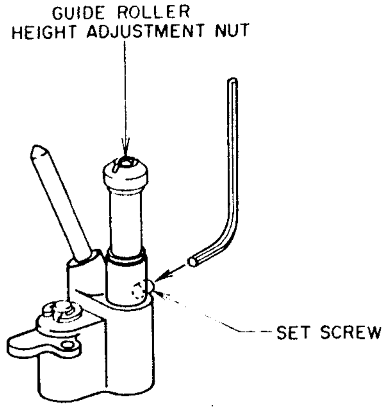

GUIDE ROLLER
HEIGHT ADJUSTMENT NUT
SET SCREW

Fig. 7-7

1) Connect an oscilloscope to TP8 (PB FM) of the Video Y PCB.
2) Playback the reference tape (AT-750795) and observe the FM envelope (TP8).
3) Turn the tracking adjustment volume (front side) counterclockwise from the "click" position to set it at the point where the FM waleform level is about half the maximum value.
4) Turn the guide roller (supply side) to adjust the start-of trace portion of the FM waveform. (See Fig. 7-2 and Note bolow).
5) Turn the guide roller (take-up side) to adjust the end-of trace portion of FM waveform. (See Fig. 7-2 and Note below).
6) Repeat the Steps 4. and 5. above until the ideal FM waveform as shown in Fig. 7-4 is obtained. Also, verify that the tape is running along the drum lead (⑦ in Fig. 7-1).
7) Turning the tracking adjustment volume, check to see that the FM waveform increases and decreases at the same ratio. (See Fig. 7-5).
8) Move the guide rollers (S and TU) as shown in Fig. 7-6 to verify that the FM waveform is restored promptly.
9) If the waveform is not restored promptly in 8. above, there should be improper contact with the V-groove on the slant pole assy. In this case, adjust the loading arm so as to ensure proper contact at the time of loading.

Note:
To adjust the guide roller, first loosen a set screw shown in Fig. 7-7 and then tighten it slightly. After adjustment, tighten it fully.

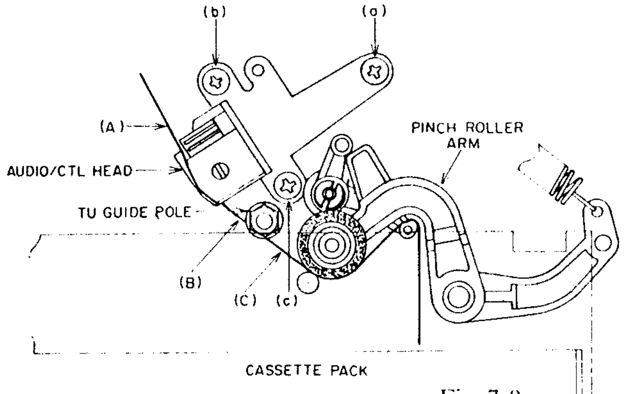

(b)
(a)
(A)
AUDIO/CTL HEAD
TU GUIDE POLE
(B)
(C)
(c)
PINCH ROLLER ARM
CASSETTE PACK

Fig. 7-8

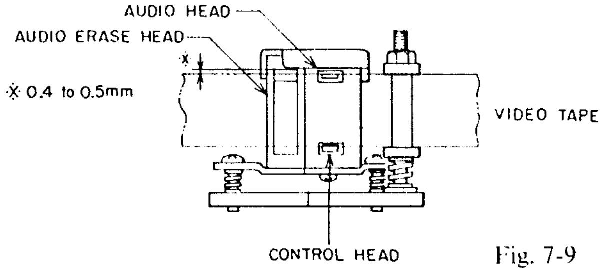

AUDIO HEAD
AUDIO ERASE HEAD
※ 0.4 to 0.5mm
VIDEO TAPE
CONTROL HEAD

Fig. 7-9

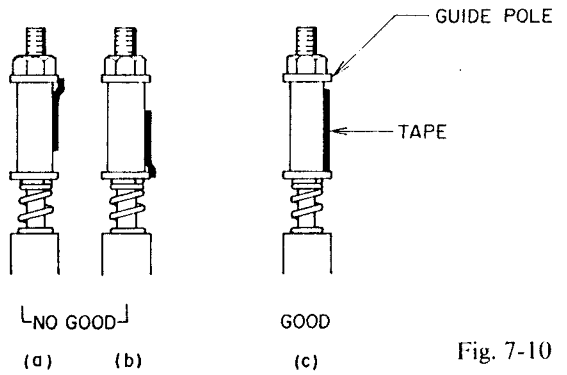

GUIDE POLE
TAPE
NO GOOD
GOOD
(a)
(b)
(c)

Fig. 7-10

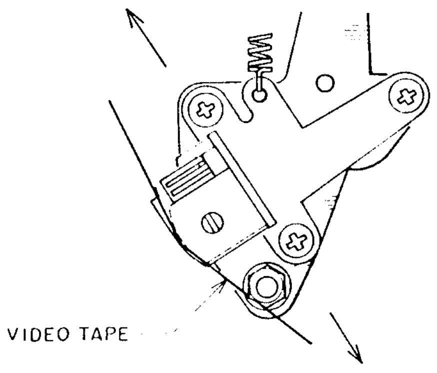


Fig. 7-11

2. AUDIO/CONTROL HEAD ADJUSTMENT

1) Connect an AC voltmeter to "Audio Out".
2) Playback the reference tape (AT-750795).
3) Turn the screw (a) while looking at the portions (A) and (B) of the tape: continue adjustment until the front face of the Audio/Control head is in parallel with the guide pole (TU). (See Fig. 7-8).
4) Turn the screws (a), (b) and (c) by the same amount so that the upper edge of the running tape is 0.4 to 0.5 mm below the upper end of the audio erase head. (See Fig. 7-9).
5) Turn the screw (b) while watching the AC voltmeter: adjust the azimuth so that the audio output level is at its maximum.
6) Press the A/C head assy lightly with the finger to verify that the audio output level is at its maximum. (See Fig. 7-11)
7) The portions (A) and (B) of the tape must be free from slack at both of its upper and lower edges (See Fig. 7-8). Also, make certain that the tape is running on the lower edge of the guide pole as illustrated in fig. 7-10.
8) Repeat Steps 3. through 7. above.
9) Paint-lock the screws and nut.

3. PINCH ROLLER CURL ADJUSTMENT

1) If wrinkles are found in the (C) portion of the tape (See Fig. 7-8), adjust the pinch roller arm so as to prevent development of wrinkles in the tape.
2) Make certain that the tape is running in the manner shown in Fig. 7-10.

4. TRACKING PEAK ADJUSTMENT

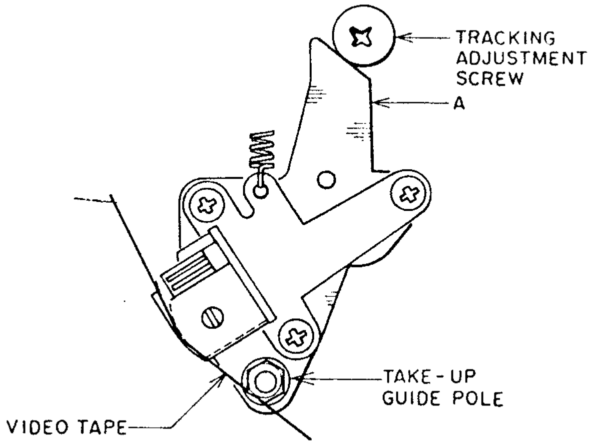

TRACKING ADJUSTMENT SCREW
A
TAKE-UP GUIDE POLE
VIDEO TAPE

Fig. 7-12

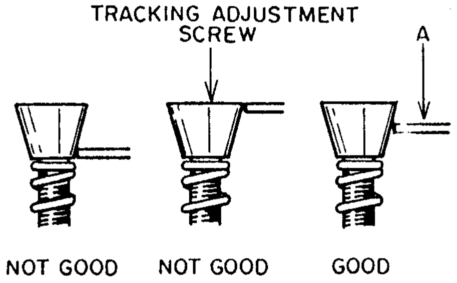

TRACKING ADJUSTMENT SCREW
A
NOT GOOD
NOT GOOD
GOOD

Fig. 7-13

1) Connect the probe of an oscilloscope to TP8 on the Video Y PCB.
2) Set the tracking adjustment volume to the "click" position.
3) Turn the tracking adjustment screw until the maximum waveform (TP8) is obtained. (See Fig. 7-12).
4) Turn the tracking adjustment screw slowly counterclockwise and set it just before the waveform of CH1 (TP8) drops.
5) Verify the condition in 4. above by turning the tracking adjustment volume.
6) Make certain that the plate A in fig. 7-12 is located about the center as illustrated in fig. 7-13.

Note:
For the FM waveform, CH1 can be identified by the output level which varies more widely when the tracking adjustment volume is turned.

5. REVIEW TAPE TRANSPORT ADJUSTMENT

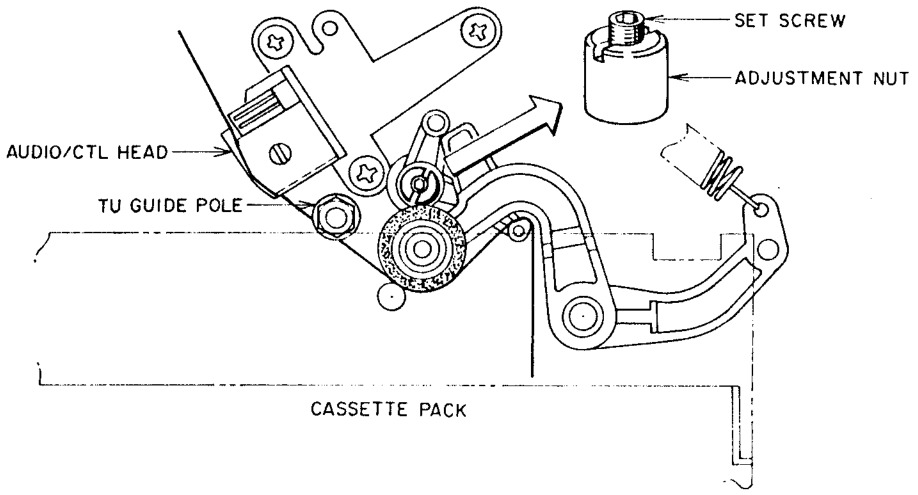

SET SCREW
ADJUSTMENT NUT
AUDIO/CTL HEAD
TU GUIDE POLE
CASSETTE PACK

Fig. 7-14

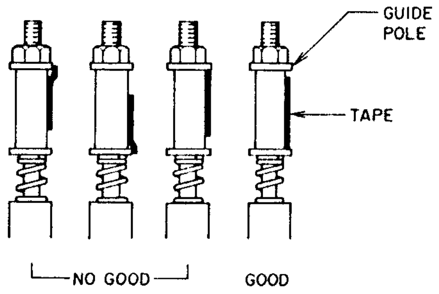

GUIDE POLE
TAPE
NO GOOD
GOOD

Fig. 7-15

1) Play the tape back and then depress the "review" button to select the review mode.
2) Loosen a set screw on the adjustment nut. (Fig. 7-14)
3) Adjust the adjustment nut so that the tape will run in the manner shown in Fig. 7-15.
4) Tighten the set screw.
5) Repeat the stop-review sequence for verification purposes.

6. FINE CUE TAPE TRANSPORT ADJUSTMENT

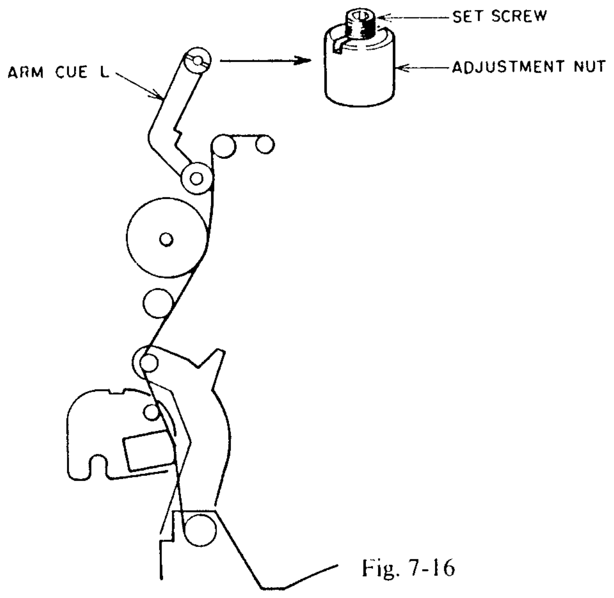


Fig. 7-16

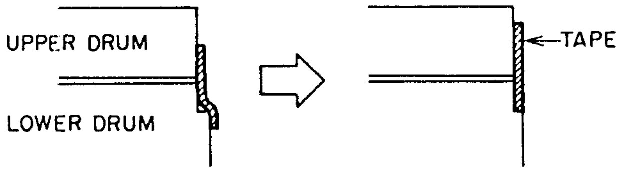


Fig. 7-17

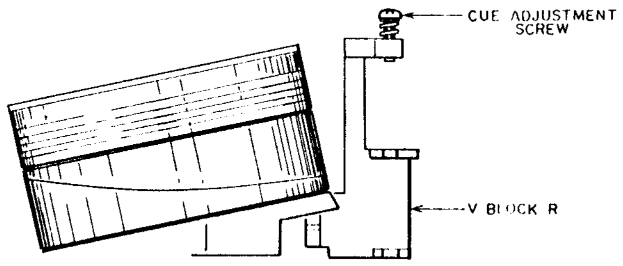


Fig. 7-18

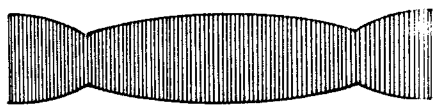


Fig. 7-19

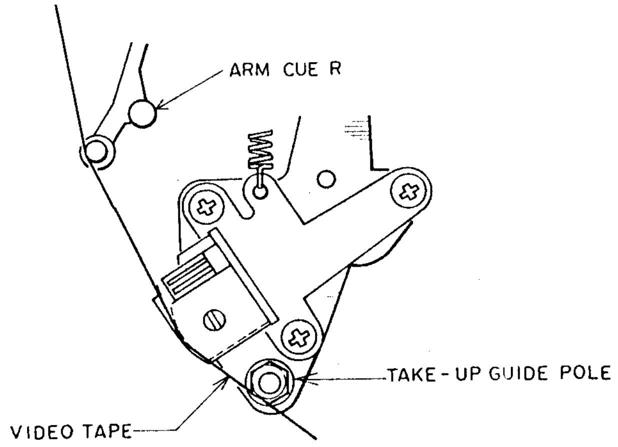


Fig. 7-20

1) Set the reference tape (AT-750795).
2) Press the playback button and then the cue button to establish the cue mode.
3) Loosen a set screw on the arm cue L. (See Fig. 7-16)
4) Turn the adjustment nut clockwise to cause the lower edge of the tape to be off the drum lead as shown in Fig. 7-17.
5) Turn the adjustment nut slowly counterclockwise until the tape edge is put on the drum lead, as shown in Fig. 7-17.
6) Tighten the set screw.
7) Connect an oscilloscope to TP8 on the Video Y PCB. Then watching the FM waveform, turn the quick finder tracking volume to bring the center of the FM waveform to the maximum point.
8) Turn the cue adjustment screw on the V block R (See Fig. 7-18) until the FM waveform assumes the form shown in Fig. 7-19.
9) Watching the tape running over the A/C head and guide pole (TU) (See Figs 17 and 18), bend the arm cue R so that the same condition as at normal play time can be obtained. (Fig. 7-20).
10) Repeat the STOP-CUE sequence for adjustment purposes.
11) Turn the quick finder tracking volume back to the "click" position.
12) Set VR14 on the Servo PCB to the point where the FM waveform is at its maximum.
13) Paint-lock each screw.

VIII. REPLACEMENT OF VIDEO HEAD

1. REPLACEMENT

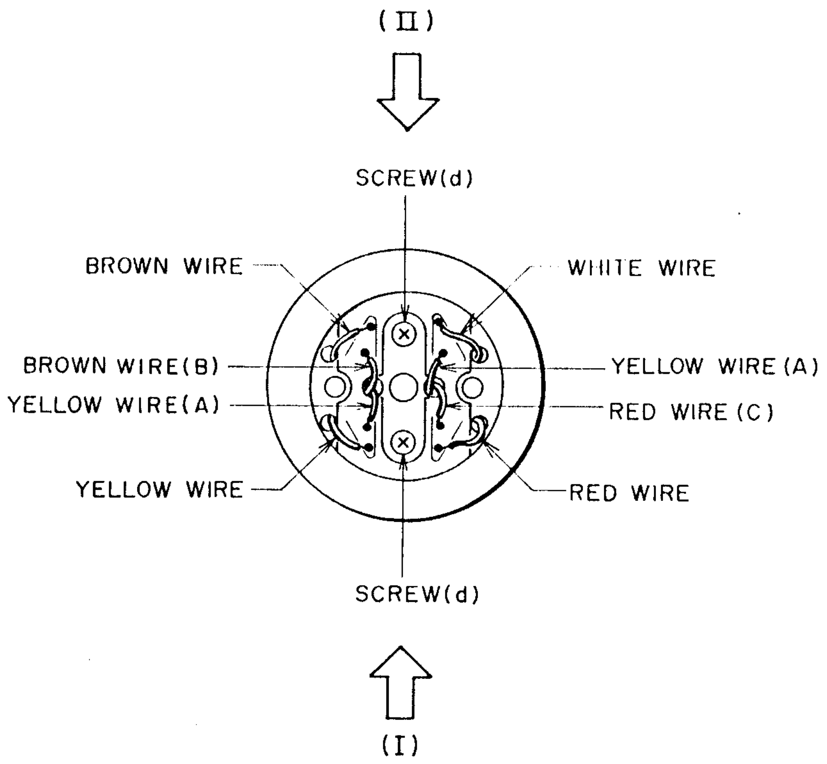


Fig. 8-1 Replacement of Video Head Assy

1) Detach soldered wires (A), (B) and (C).
2) Remove two screws (d) and lift the upper drum assy.
3) Mount a new head assy and solder the wires (See Note).
4) Tighten the two screws (d).
5) The following must be done after replacement:
① PB drum switching point adjustment.
② PB tracking adjustment.
③ REC drum switching point adjustment.
④ Pre-amp peaking adjustment.
⑤ PB chroma level adjustment.
⑥ PB cue verification.

Note:
When mounting the upper drum assy, be careful not to allow dirt to enter between the upper drum assy and the rotary base.

2. ALIGNMENT ADJUSTMENT

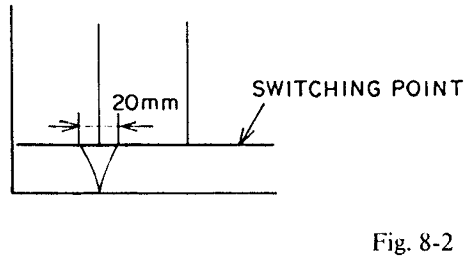


Fig. 8-2

1) If misalignment occurs (See Fig. 8-2) below the switching point at the time the reference tape (AT-750795) is played back, the following adjustment must be made.
2) Where the amount of misalignment decreases as the normal tracking volume (front side) is turned clockwise from the "click" position, loosen the set screws (d) slightly on the head assy and move the Head assy slightly towards the red/yellow wire (See Fig. 8-1). Then tighten the screws (d) and verify alignment.
3) Where the amount of misalignment decreases as the normal tracking volume is turned counterclockwise from the "click" position, move the Head assy slightly from the brown/white wire (See Fig. 8-1, II) just as in 2. above before verification.
4) Verify the switching point and tracking action.

Note:
The allowable maximum misalignment should be as follows:

● 19-inch monitor	20 mm
● 16-inch monitor	16 mm
● 12-inch monitor	12 mm

IX. ELECTRICAL ADJUSTMENT

1. REGULATOR CIRCUIT ADJUSTMENT

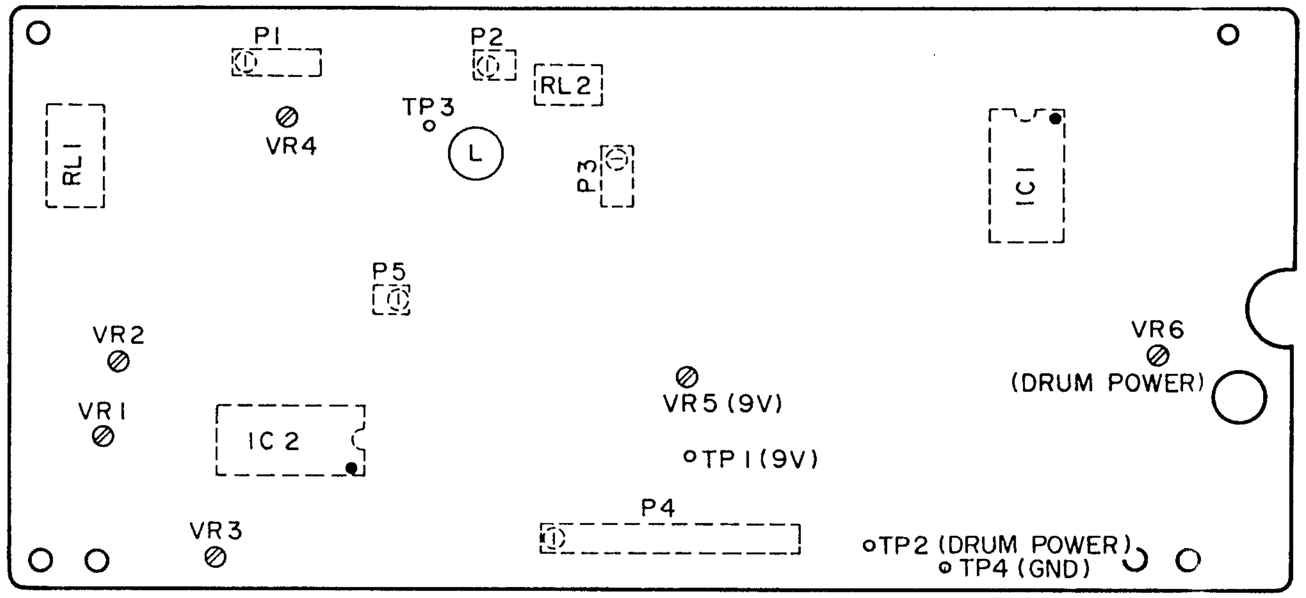

P1
P2
RL2
TP3
L
RL1
VR4
P3
IC1
P5
VR2
VR6
(DRUM POWER)
VR1
IC2
VR5 (9V)
TP1 (9V)
VR3
P4
TP2 (DRUM POWER)
TP4 (GND)

Fig. 9-1 Audio & Power PCB (V2004A502C)

STEP	ADJUSTMENT ITEM	TEST POINT	ADJUSTMENT PART	MODE	RESULT
1	DC 9V	TP1	VR5	REC	DC+9.2V ± 0.1V
2	Drum Power	TP2	VR6	PB	DC+8.2V ± 0.2V

2. SERVO PCB ADJUSTMENT

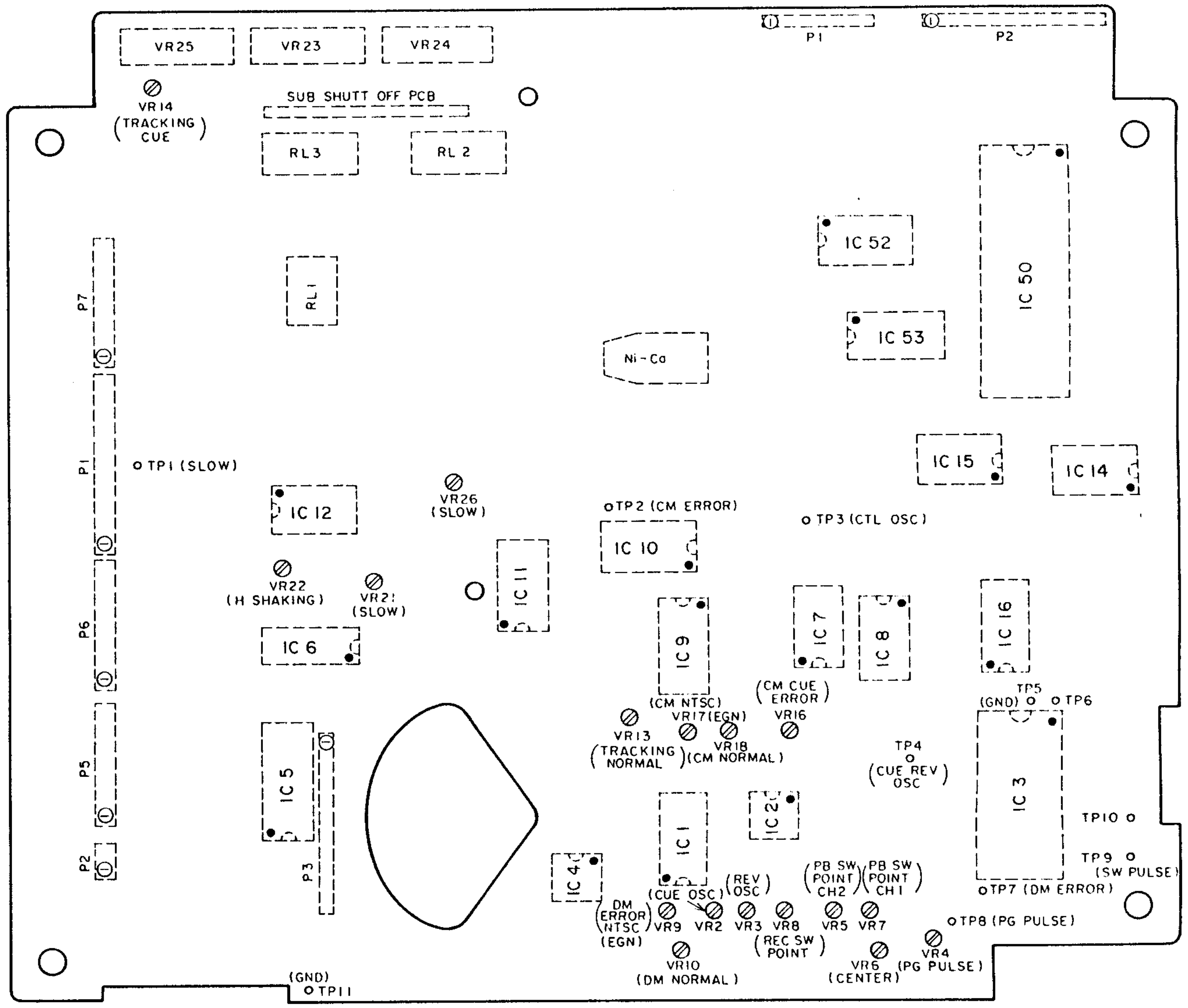
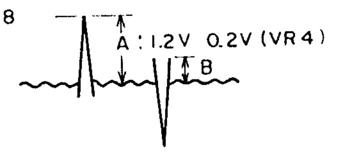
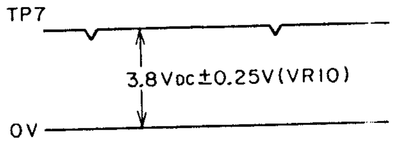
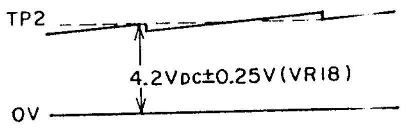
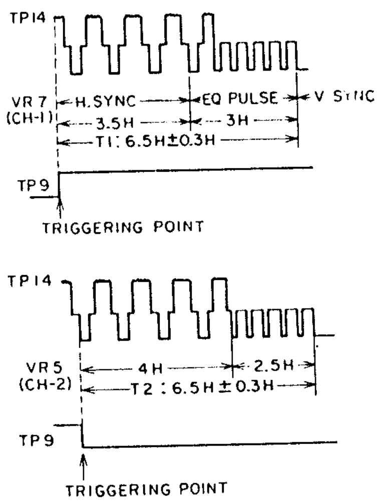
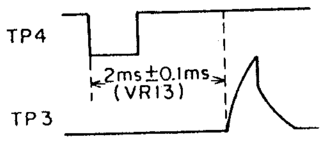
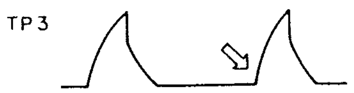
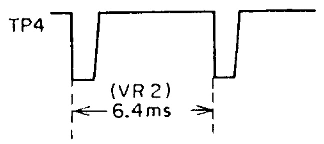
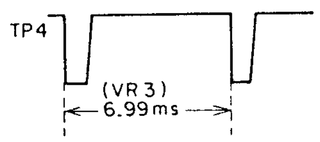
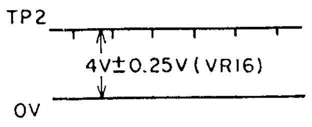
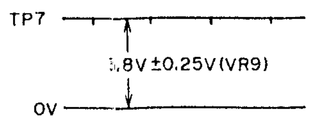
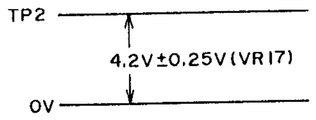
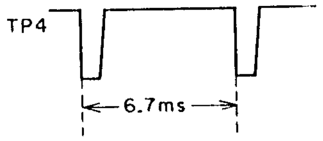
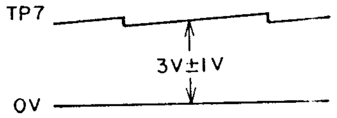
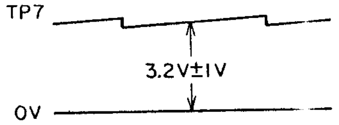
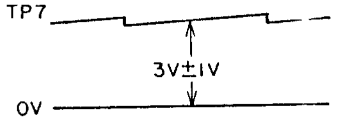
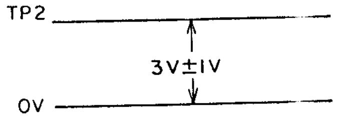

VR25
VR23
VR24
P1
P2
VR14 (TRACKING CUE)
SUB SHUTT OFF PCB
RL3
RL2
IC52
IC50
P7
RL1
IC53
Ni-Cd
P1
TP1 (SLOW)
IC15
IC14
IC12
VR26 (SLOW)
TP2 (CM ERROR)
TP3 (CTL OSC)
IC10
IC11
P6
VR22 (H SHAKING)
VR21 (SLOW)
IC9
IC7
IC8
IC16
IC6
(CM NTSC)
VR17 (EGN)
(CM CUE ERROR)
VR16
TP5 (GND)
TP6
VR13 (TRACKING NORMAL)
VR18 (CM NORMAL)
TP4 (CUE REV OSC)
P5
IC5
IC3
IC1
IC2
TP10
TP9 (SW PULSE)
P2
P3
IC4
DM ERROR NTSC (EGN)
(CUE OSC)
(REV OSC)
(PB SW POINT CH2)
(PB SW POINT CH1)
TP7 (DM ERROR)
VR9
VR2
VR3
VR8
VR5
VR7
TP8 (PG PULSE)
VR10 (DM NORMAL)
(REC SW POINT)
VR6 (CENTER)
VR4 (PG PULSE)
(GND) TP11

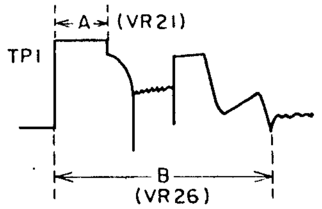
Fig. 9-2 Servo & Syscon PCB (V2004A501A)

Prior to adjustment:
1) Quick Finder Tracking Volume (VR25) : Click Position
2) Tracking Volume (VR23) : Click Position
3) Fine Slow Tracking Volume (VR24) : Click Position
4) Set the VTR to the TEST MODE

Step	Adjustment Item	Input	Mode	Test Point	Adjustment Parts	Result & Remarks
1	PG Pulse	Test Tape Video Reference (PAL/ SECAM)	PB	TP8	VR4	 TP8 A : 1.2V 0.2V (VR4) B (B: Less than 0.5V)
2	Drum Motor Normal Speed	Test Tape Video Reference (PAL SECAM)	PB	TP7	VR10	 TP7 3.8Vdc±0.25V(VR10) 0V (Fluctuations must be 0.5V or less.)
3	Capstan Motor Normal Speed	Test Tape Video Reference (PAL/ SECAM)	PB	TP2	VR18	 TP2 4.2Vdc±0.25V(VR18) 0V (Fluctuations must be 0.5V or less.)
4	PB Switching Point	Test Tape Video Reference (PAL/ SECAM)	PB	Video Out (Jack PCB) or (Video Chroma PCB) TP9 (Trigger) (SW Pulse)	VR7 (CH1) VR5 (CH2) VR6 (Center)	 TP14 VR 7 (CH-1) H. SYNC EQ PULSE V SYNC 3.5H 3H T1: 6.5H±0.3H TP9 TRIGGERING POINT TP14 VR5 (CH-2) 4H 2.5H T2 : 6.5H±0.3H TP9 TRIGGERING POINT The difference between T1 and T2 should be within 1H
5	Tracking Normal Speed	Test Tape Video Reference (PAL/ SECAM)	PB	TP3 TP4 (Trigger)	VR13	 TP4 2ms±0.1ms (VR13) TP3

Step	Adjustment Item	Input	Mode	Test Point	Adjustment Parts	Result & Remarks
6	CTL OSC Confirmation	Test Tape Video Reference (PAL/ SECAM)	PB Cue			 Verify that the picture does not change in the cue mode.
7	Cue OSC	Test Tape Video Color Bar (PAL)	PB Cue	TP4	VR2	 TP4 (VR2) 6.4ms 1. Adjust VR2 to 156 Hz ± 1 Hz using frequency counter. 2. Watching color bar pattern, final-adjust VR2 so that picture is free from "color shift".
8	Review OSC	Test Tape Video Color Bar (PAL)	PB Review	TP4	VR3	 TP4 (VR3) 6.99ms 1. Adjust VR3 to 143 Hz ± 1 Hz using frequency counter. 2. Watching color bar pattern, final-adjust VR3 so that picture is free from "color shift".
9	Capstan Motor Cue	Test Tape Video Reference (PAL/ SECAM)	PB Cue	TP2	VR16	 TP2 4V±0.25V (VR16) 0V
10	Tracking Cue	Color Bar from Color Bar Generator	REC/ PB Cue		VR14	After recording, adjust VR14, while watching picture in PB/Cue mode, so that noise band is no more visible.
11	NTSC Drum Motor	Test Tape Video Reference (NTSC)	PB	TP7	VR9	 TP7 .8V±0.25V(VR9) 0V Set the Mode Selector to 'NTSC'.

Step	Adjustment Item	Input	Mode	Test Point	Adjustment Parts	Result & Remarks
12	NTSC Capstan Motor	Test Tape Video Reference (NTSC)	PB	TP2	VR17	 Set the Mode Selector to 'NTSC'.
13	REC Switching Point	Color Bar from Color Bar Generator	REC	Video Out (Jack PCB) or (Video Chroma PCB) TP9 (Trigger) (SW Pulse)		Adjust T1 waveform in Step 4 to 6.5H ±0.3H.
14	Rec Cancel OSC Confirmation	Color Bar from Color Bar Generator	REC/ PB	TP4	Confirm	 Check for 147 Hz ± 3 Hz using frequency counter. Note: Recording must continue for 5 seconds or more if "REC Cancel" is depressed within 5 seconds, than "REC Pause" results.
15	Drum Motor Cue Confirmation		PB Cue	TP7	Confirm	
16	Drum Motor Review Confirmation		PB Review	TP7	Confirm	
17	Drum Motor Rec Cancel Confirmation		REC Cancel	TP7	Confirm	
18	Capstan Motor Rec Cancel Confirmation	Color Bar from Color Bar Generator	REC/ REC Cancel	TP2	Confirm	

Step	Adjustment Item	Input	Mode	Test Point	Adjustment Parts	Result & Remarks
19	Fine Slow	Color Bar from Color Bar Generator	REC/ PB Slow	TP1	VR21 VR26 VR22	 1. A: must be adjusted to 18 ms ± 2ms with VR21. B: After recording/playback, select slow mode and adjust VR27 so that noise band is no more visible in picture. 2. Slow drum adjustment: Adjust VR22 so that picture will not vibrate in horizontal direction.

3. VIDEO PCB ADJUSTMENT

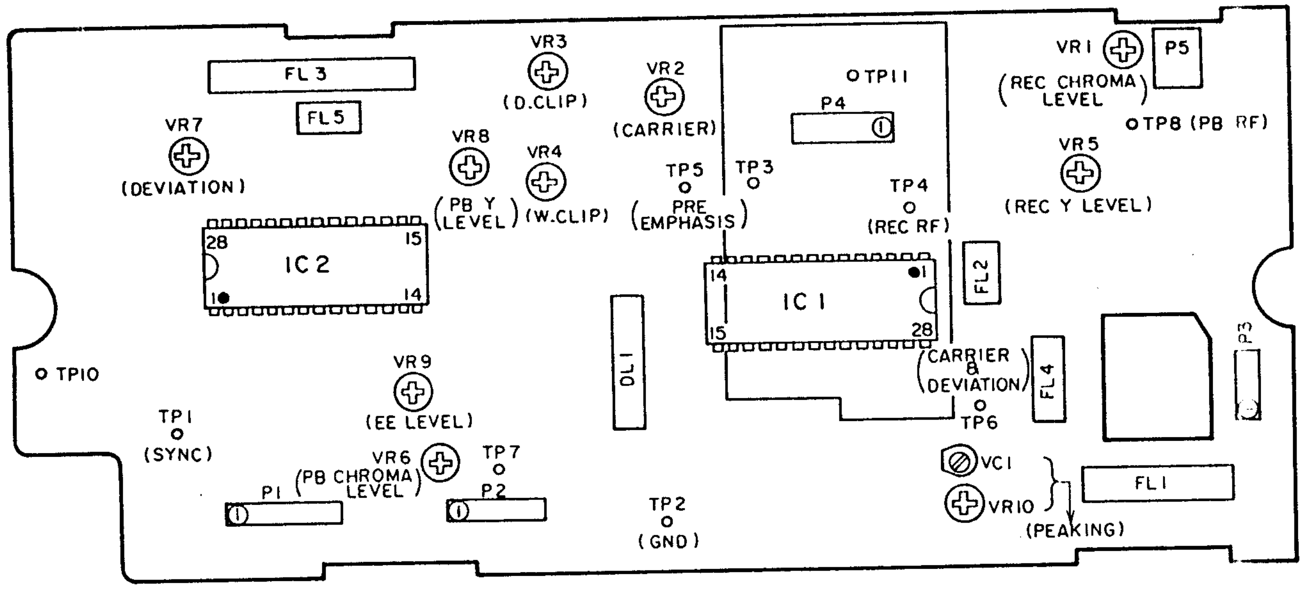

FL3
FL5
VR7 (DEVIATION)
VR8 (PB Y LEVEL)
VR4 (W.CLIP)
VR3 (D.CLIP)
VR2 (CARRIER)
TP5 (PRE EMPHASIS)
TP3
TP11
P4
TP4 (REC RF)
VR1 (REC CHROMA LEVEL)
P5
TP8 (PB RF)
VR5 (REC Y LEVEL)
IC2
IC1
FL2
DL1
(CARRIER & DEVIATION)
TP6
FL4
P3
TP10
TP1 (SYNC)
VR9 (EE LEVEL)
VR6 (PB CHROMA LEVEL)
TP7
P1
P2
TP2 (GND)
VC1
VR10 (PEAKING)
FL1

Fig. 9-3 Video Y PCB (V2004A502B)

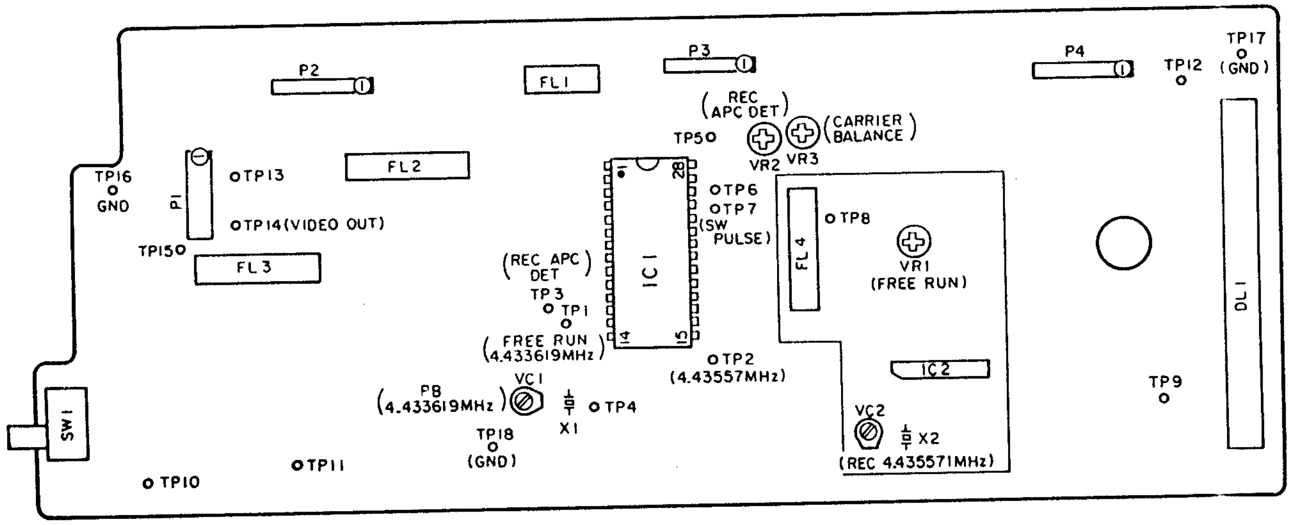
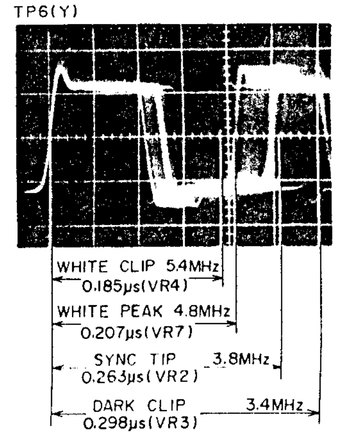
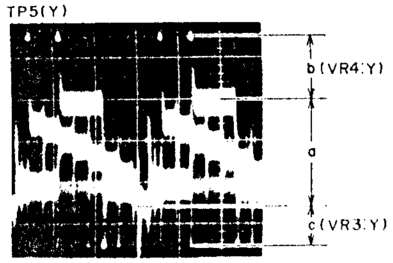
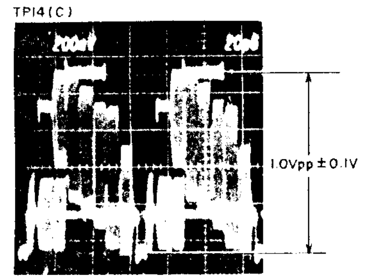
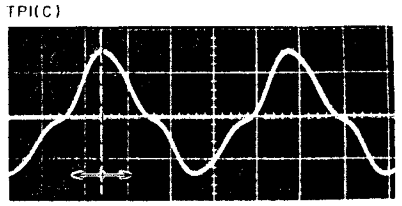
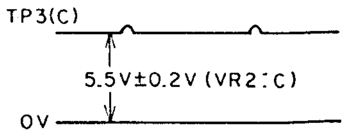
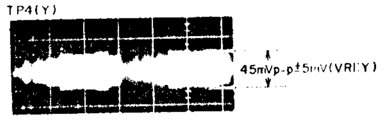
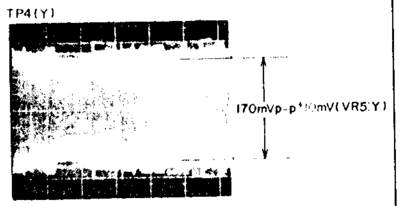
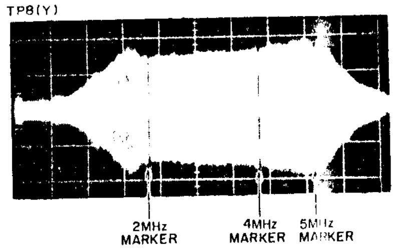
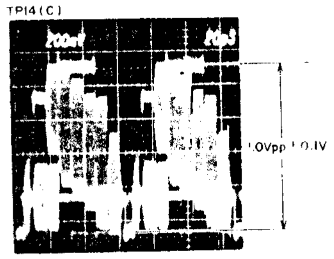
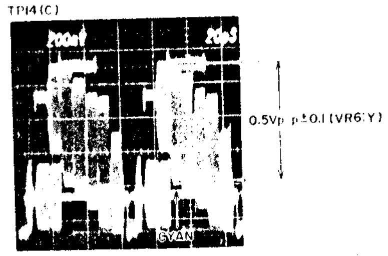
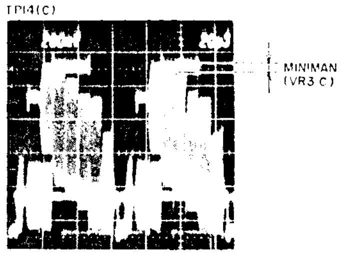
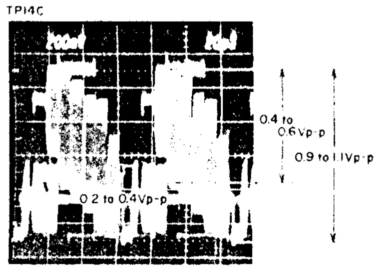

P2
FL1
P3
(REC APC DET)
(CARRIER BALANCE)
TP5
VR2 VR3
P4
TP12
TP17 (GND)
TP16 GND
P1
TP13
TP14 (VIDEO OUT)
FL2
TP15
FL3
IC1
TP6
TP7 (SW PULSE)
FL4
TP8
VR1 (FREE RUN)
DL1
(REC APC DET)
TP3
TP1
(FREE RUN 4.433619MHz)
VC1
(PB 4.433619MHz)
TP4
X1
TP18 (GND)
TP2 (4.43557MHz)
IC2
VC2
X2
(REC 4.435571MHz)
TP9
SW1
TP10
TP11

Fig. 9-4 Video Chroma PCB (V2004A502A)

Step	Adjustment Item	Input	Mode	Test Point	Adjustment Parts	Result & Remarks
1	Carrier and Deviation	Color Bar from Color Bar Generator	REC	TP6 (Y)	VR2 (Y) (Carrier) VR7 (Y) (Deviation)	
2	White Clip and Dark Clip	Color Bar from Color Bar Generator	REC	TP5 (Y) TP1 (Y) (Trigger)	VR4 (Y) (White Clip) VR3 (Y) (Dark Clip)	 a : b = 1 : 0.64 a : c = 1 : 0.42
3	E-E Level	Color Bar from Color Bar Generator	E-E	TP14 (Chroma) TP1 (Y) (Trigger)	VR9 (Y)	
4	VXO 4.435571 MHz	No Signal	REC	TP2 (Chroma)	VC2 (Chroma)	4.435571 MHz ± 200 Hz.
5	VCO Free Run Frequency	No Signal	REC	TP1 (Chroma)	VR1 (Chroma)	 Must be made symmetrical with VR1 (C).
6	REC APC DET	Color Bar from Color Bar Generator	REC	TP3 (Chroma) TP1 (Y) (Trigger)	VR2 (Chroma)	 Note: Waveform must be stationary.

Step	Adjustment Item	Input	Mode	Test Point	Adjustment Parts	Result & Remarks
7	REC Current	Color Bar from Color Bar Generator	REC	TP4 (Y) TP1 (Y) (Trigger)	VR1 (Y) VR5 (Y)	  1. Cause Y REC current to be at zero with VR5 (Y). 2. Cause chroma REC current to be at 45 ± 5 mVp-p with VR1 (Y). 3. Cause Y REC current to be at 170 ± 10 mVp-p with VR5 (Y).
8	Pre Amp Peaking	Test Tape Video RF Sweep (PAL/ SECAM)	PB	TP8 (Y) TP7 (Chroma) (Trigger)	VR10 (Y) VC1 (Y)	Must be made flat from 2 MHz to 5 MHz.  Trigger +: CH-1 −: CH-2 (Confirm)
9	PB VCO	Test Tape Video Color Bar (PAL)	PB	TP1 (Chroma)	VC1 (Chroma)	4.433619 MHz ± 10 Hz
10	PB Y Level	Test Tape Video Color Bar (PAL)	PB	TP14 (Chroma) TP1 (Y) (Trigger)	VR8 (Y)	
11	PB Chroma Level	Test Tape Video Color Bar (PAL)	PB	TP14 (Chroma) TP1 (Y) (Trigger)	VR6 (Y)	
12	Carrier Balance	Test Tape Video Color Bar (PAL)	PB	TP14 (Chroma) TP1 (Y) (Trigger)	VR3 (Chroma)	 Verify on screen that there is no carrier leak.
13	NTSC PB Level Confirmation	Test Tape Video Color Bar (NTSC)	PB	TP14 (C) TP1 (Y) (Trigger)	Confirm	 Set the Mode Selector Switch to 'NTSC'.

4. AUDIO P.C. BOARD ADJUSTMENT

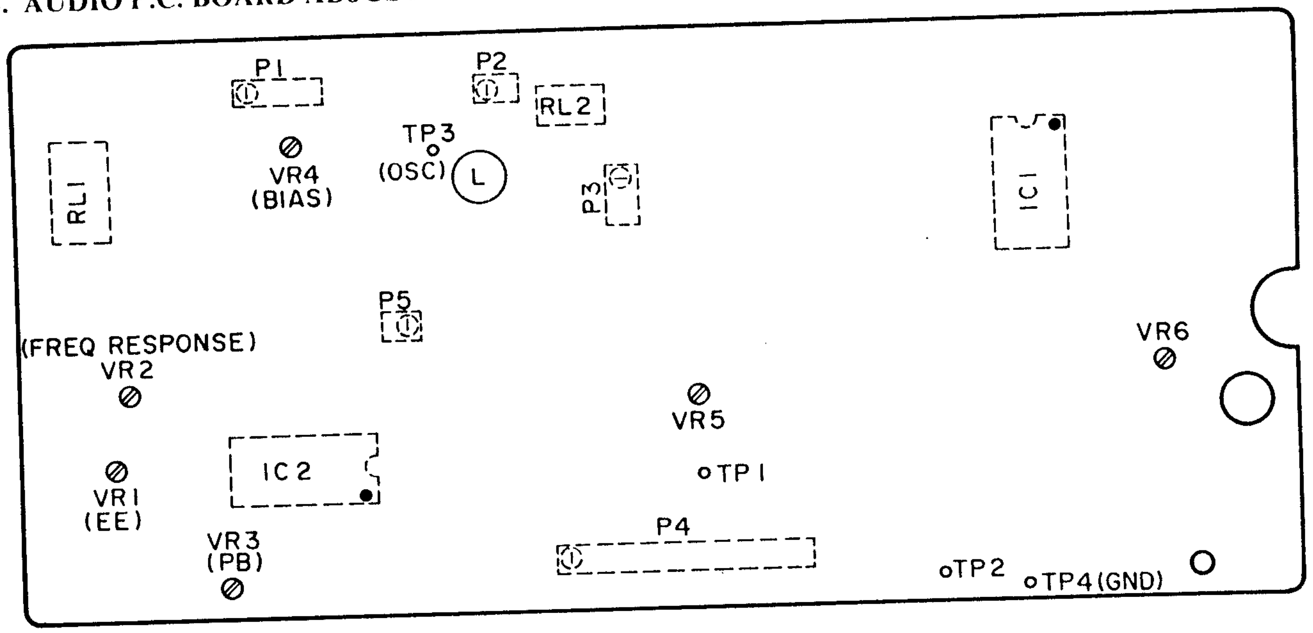

P1
P2
RL2
TP3
(OSC)
L
VR4
(BIAS)
RL1
P3
IC1
P5
(FREQ RESPONSE)
VR2
VR6
VR5
TP1
IC2
VR1
(EE)
VR3
(PB)
P4
TP2
TP4(GND)

Fig. 9-5 Audio & Power PCB (V2004A502C)

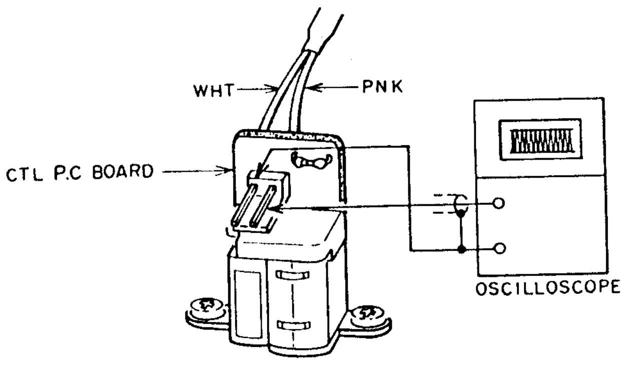
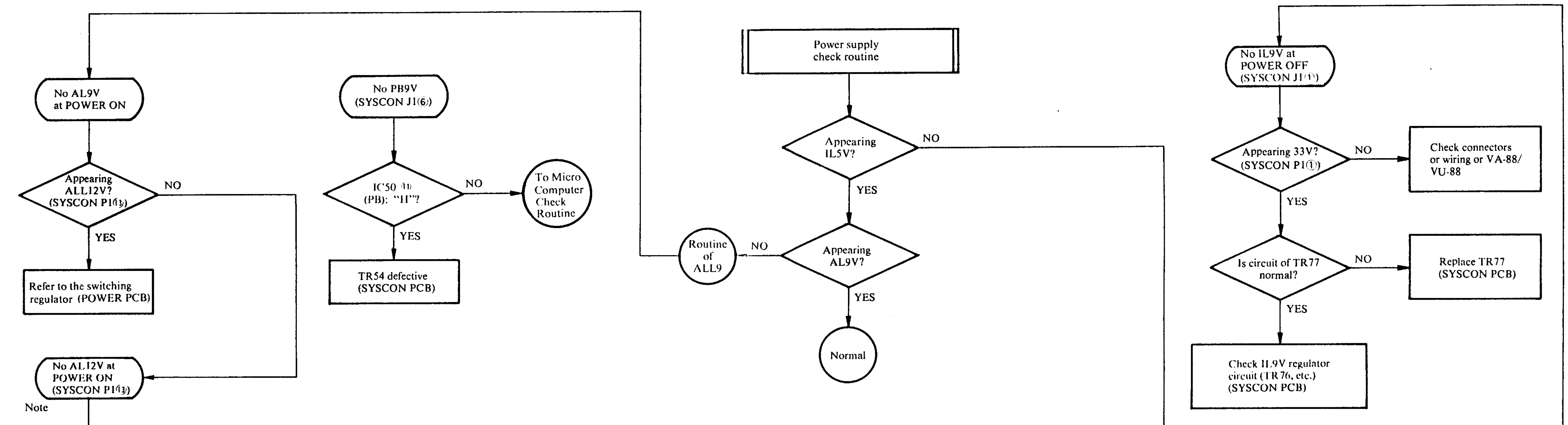

WHT
PNK
CTL P.C BOARD
OSCILLOSCOPE

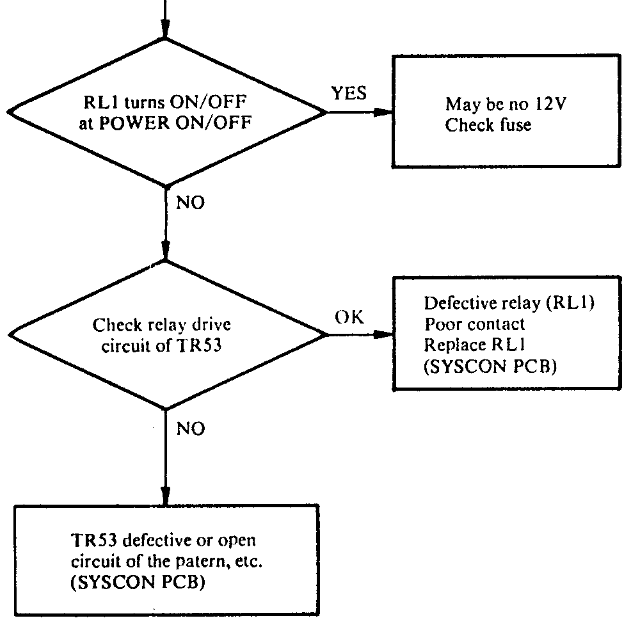
Fig. 9-6 Bias Level Adjustment

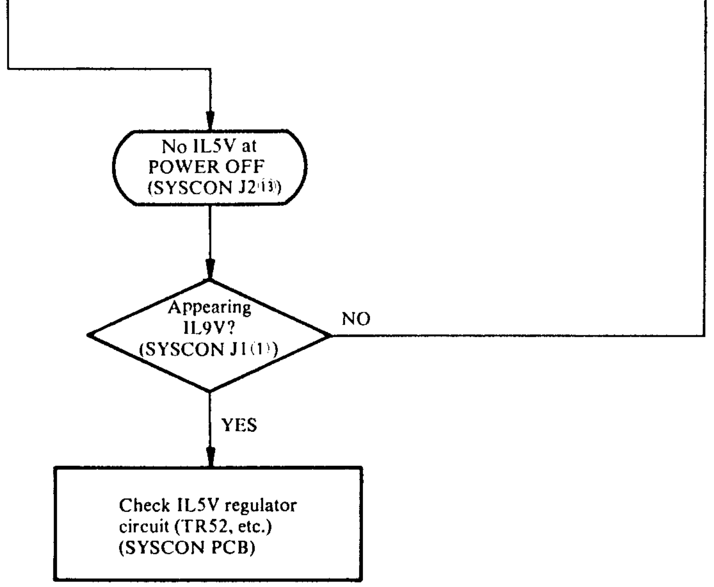
Step	Adjustment Item	Input	Mode	Test Point	Adjustment Parts	Result & Remarks
1	E-E Level	Audio Input 1 kHz, -20 dB	E-E	Audio Out	VR1	-6 dBm ±0.5 dBm
2	PB Level	Test Tape Video W & F (PAL/SECAM)	PB	Audio Out	VR3	-6 dBm ±0.5 dBm
3	Bias Level		REC	(Fig. 9-6)	VR4	4.2 mVp-p ±0.1 mV (Rec/PB Level Confirm: -6 dBm ±0.5 dBm)
4	Frequency Response	Audio Input 100 Hz, -20 dB 1 kHz, -20 dB 7 kHz, -20 dB	REC/PB	Audio Out	VR2	100 Hz : -6 dBm ± 1 dBm 1 kHz : -6 dBm ± 1 dBm 7 kHz : -6 dBm ± 1 dBm
5	Distortion Factor	Audio Input 1 kHz, -20 dB	REC/PB	Audio Out	Confirm	Less than 3%
6	Adjust by repeating steps 3, 4 and 5					

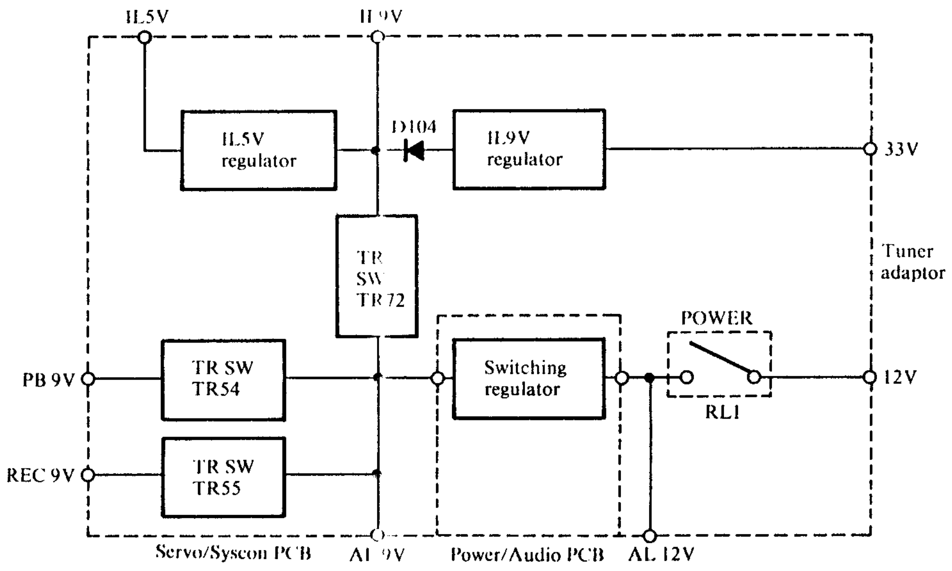
X. TROUBLESHOOTING CHART

1. POWER SUPPLY REPAIRING FLOW CHART


No AL9V
at POWER ON
Appearing
ALL12V?
(SYSCON P1⑬)
NO
YES
Refer to the switching
regulator (POWER PCB)
No PB9V
(SYSCON J1⑥)
IC50 ⑪
(PB): "H"?
NO
YES
To Micro
Computer
Check
Routine
TR54 defective
(SYSCON PCB)
Power supply
check routine
Appearing
IL5V?
NO
YES
Routine
of
ALL9
NO
Appearing
AL9V?
YES
Normal
No IL9V at
POWER OFF
(SYSCON J1①)
Appearing 33V?
(SYSCON P1①)
NO
Check connectors
or wiring or VA-88/
VU-88
YES
Is circuit of TR77
normal?
NO
Replace TR77
(SYSCON PCB)
YES
Check IL9V regulator
circuit (TR76, etc.)
(SYSCON PCB)
No AL12V at
POWER ON
(SYSCON P1⑬)
Note


RL1 turns ON/OFF
at POWER ON/OFF
YES
May be no 12V
Check fuse
NO
Check relay drive
circuit of TR53
OK
Defective relay (RL1)
Poor contact
Replace RL1
(SYSCON PCB)
NO
TR53 defective or open
circuit of the patern, etc.
(SYSCON PCB)

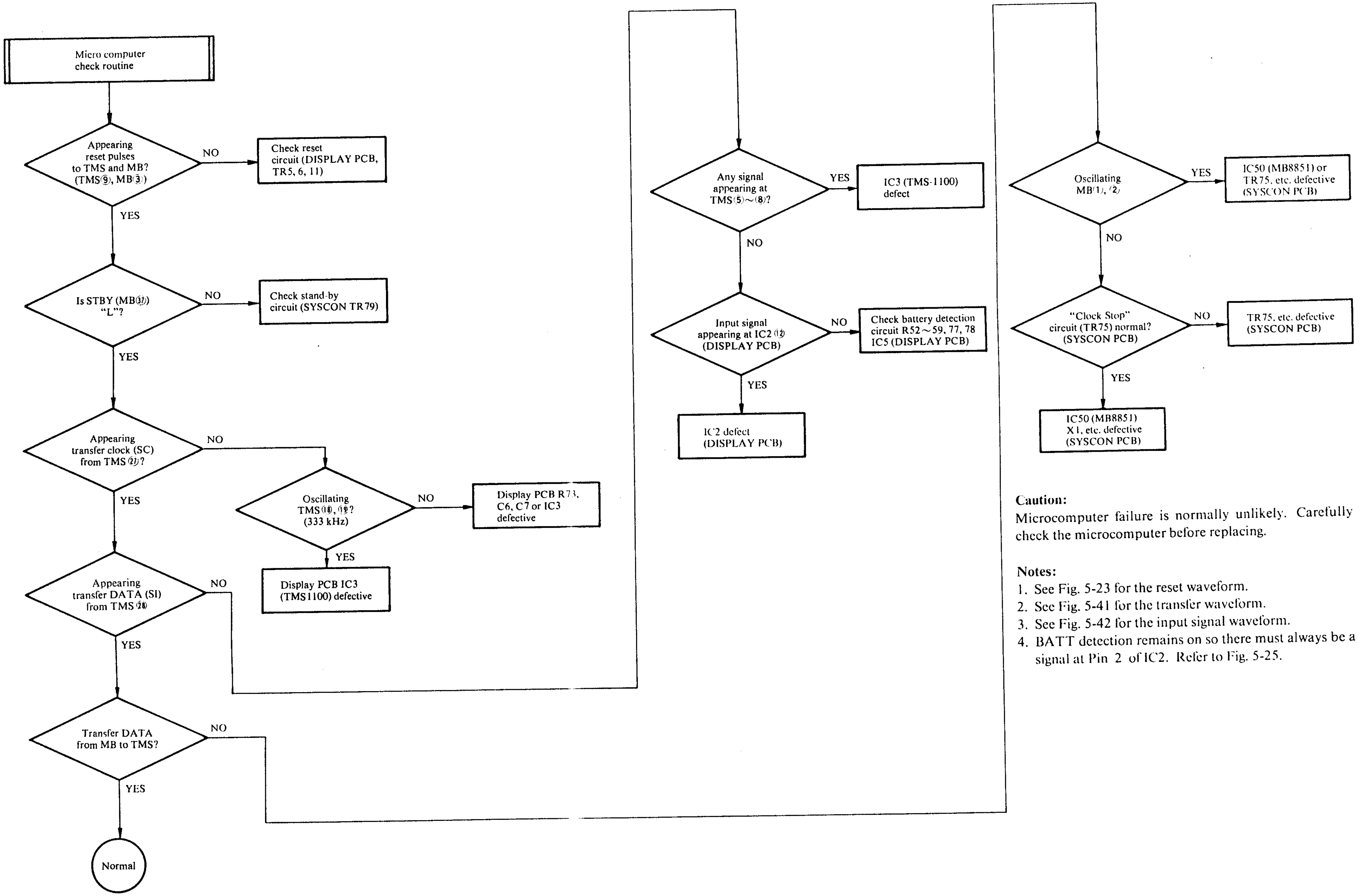

No IL5V at
POWER OFF
(SYSCON J2⑬)
Appearing
IL9V?
(SYSCON J1①)
NO
YES
Check IL5V regulator
circuit (TR52, etc.)
(SYSCON PCB)


IL5V
IL9V
IL5V
regulator
D104
IL9V
regulator
33V
Tuner
adaptor
TR
SW
TR72
POWER
PB 9V
TR SW
TR54
Switching
regulator
RL1
12V
REC 9V
TR SW
TR55
Servo/Syscon PCB
AL 9V
Power/Audio PCB
AL 12V

Power Block Diagram

Note:
When the power switch is pushed on, an $\overline{\text{ALL}}$ signal is normally sent from the microcomputer to lock the switch so that power remains on even if the power switch is released.

2. MICRO COMPUTER REPAIRING FLOW CHART


Micro computer check routine
Appearing reset pulses to TMS and MB? (TMS⑨, MB③)
NO
Check reset circuit (DISPLAY PCB, TR5, 6, 11)
YES
Is STBY (MB㉛) "L"?
NO
Check stand-by circuit (SYSCON TR79)
YES
Appearing transfer clock (SC) from TMS ㉑?
NO
Oscillating TMS⑱, ⑲? (333 kHz)
NO
Display PCB R73, C6, C7 or IC3 defective
YES
Display PCB IC3 (TMS1100) defective
YES
Appearing transfer DATA (SI) from TMS ㉘
NO
YES
Transfer DATA from MB to TMS?
NO
YES
Normal
Any signal appearing at TMS⑤~⑧?
YES
IC3 (TMS-1100) defect
NO
Input signal appearing at IC2 ⑫ (DISPLAY PCB)
NO
Check battery detection circuit R52~59, 77, 78 IC5 (DISPLAY PCB)
YES
IC2 defect (DISPLAY PCB)
Oscillating MB①, ②
YES
IC50 (MB8851) or TR75, etc. defective (SYSCON PCB)
NO
"Clock Stop" circuit (TR75) normal? (SYSCON PCB)
NO
TR75, etc. defective (SYSCON PCB)
YES
IC50 (MB8851) X1, etc. defective (SYSCON PCB)

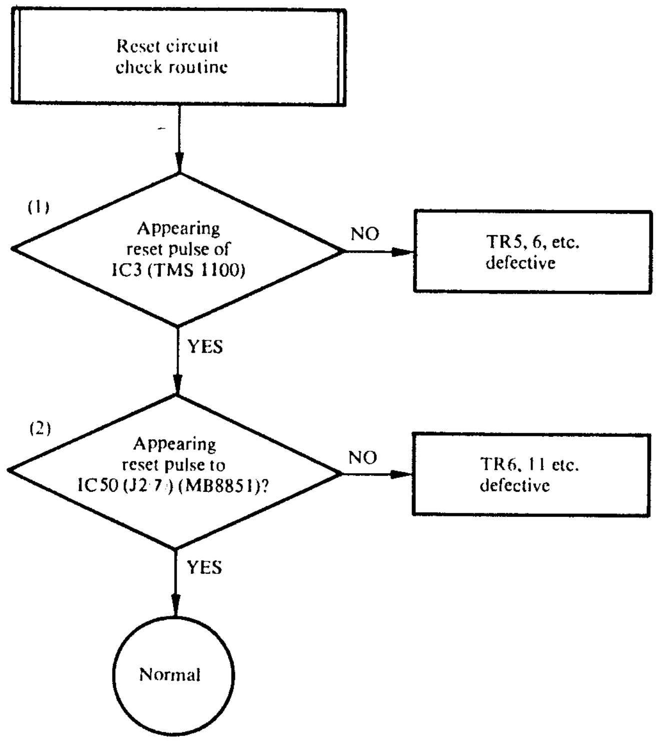
Caution:

Microcomputer failure is normally unlikely. Carefully check the microcomputer before replacing.

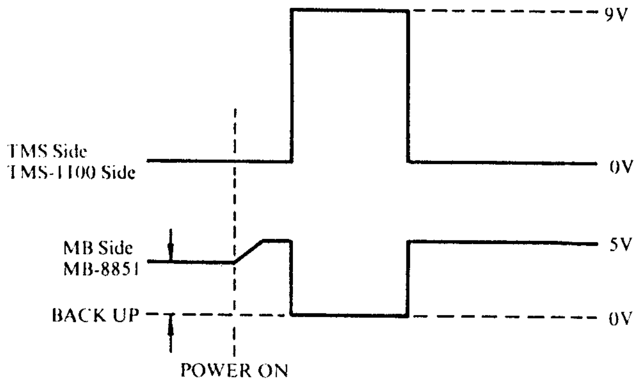
Notes:

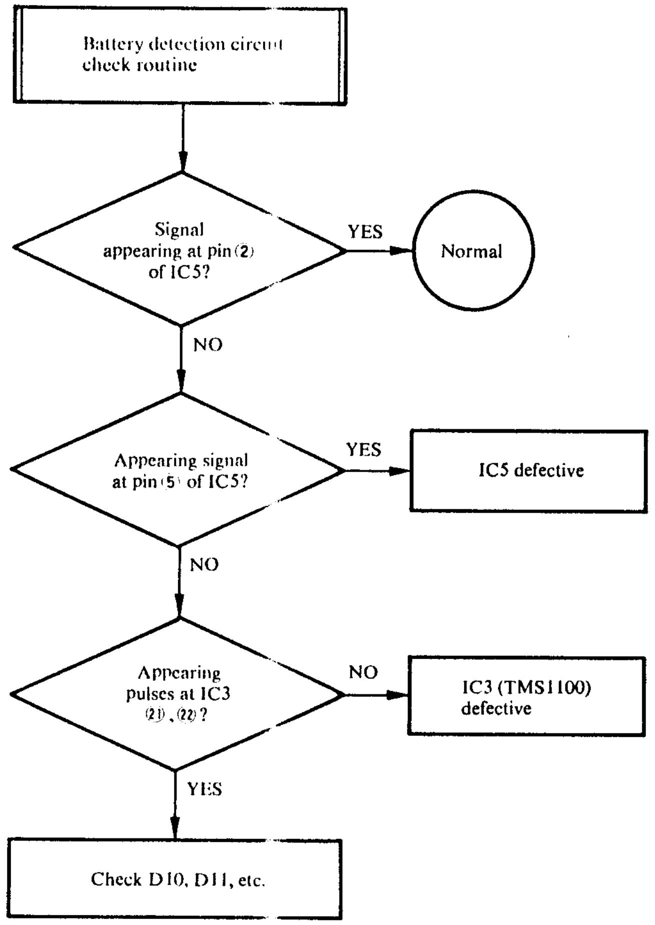
1. See Fig. 5-23 for the reset waveform.
2. See Fig. 5-41 for the transfer waveform.
3. See Fig. 5-42 for the input signal waveform.
4. BATT detection remains on so there must always be a signal at Pin 2 of IC2. Refer to Fig. 5-25.

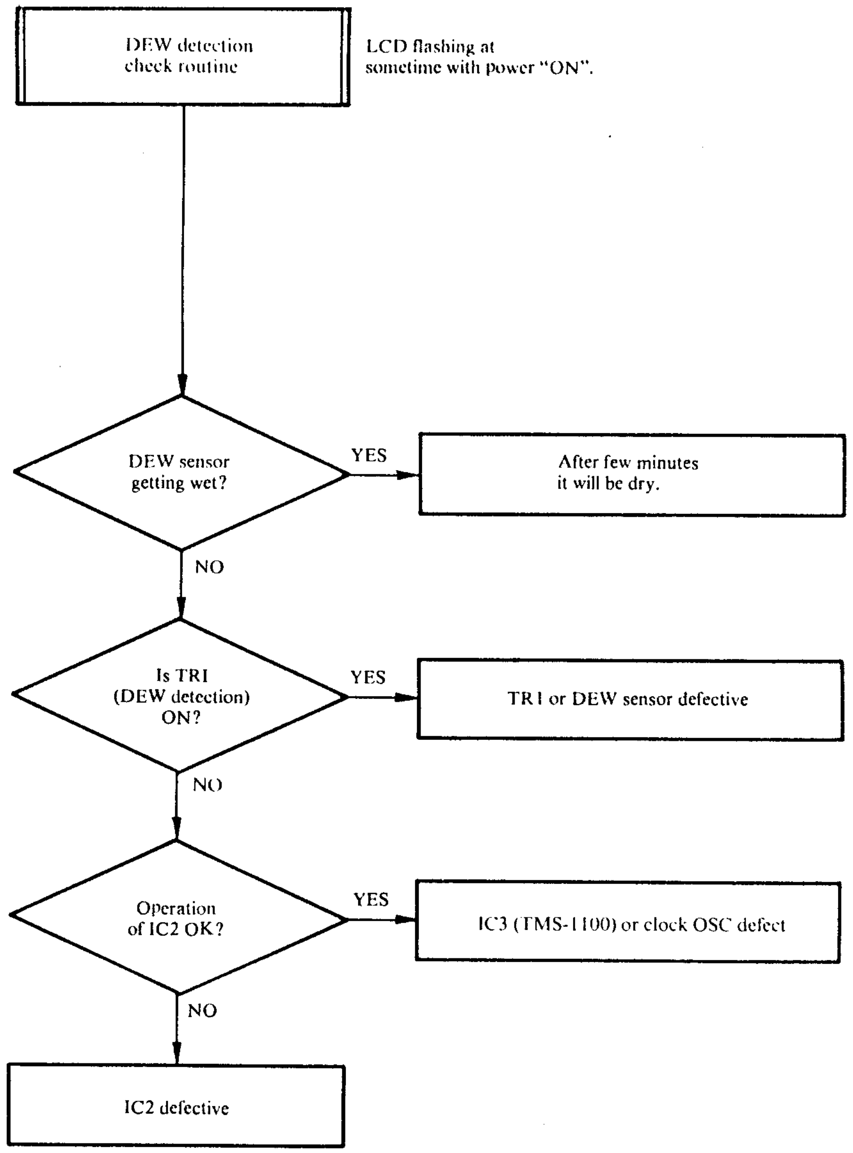
3. CIRCUMFERENCE CIRCUIT OF MICRO COMPUTER CHECKING FLOW CHART (DISPLAY PCB)


Reset circuit check routine
(1)
Appearing reset pulse of IC3 (TMS 1100)
NO
TR5, 6, etc. defective
YES
(2)
Appearing reset pulse to IC50 (J2 7) (MB8851)?
NO
TR6, 11 etc. defective
YES
Normal

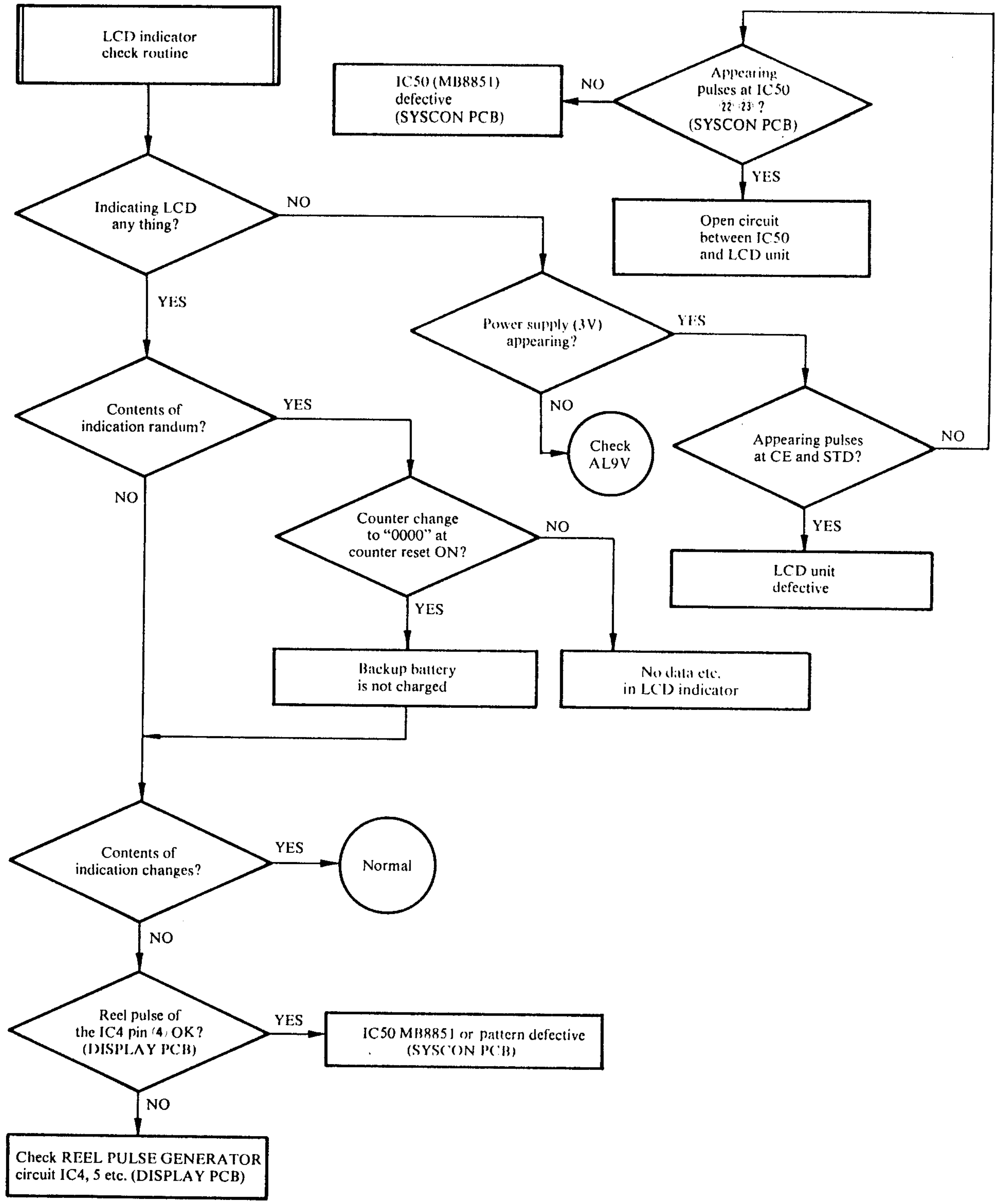
Caution:
Only a reset pulse is emitted a few seconds after the power switch for VU-88 or VA-88 is pushed on except, (1), (2) Reset pulse Waveform (When using storage).


9V
TMS Side
TMS-1100 Side
0V
MB Side
MB-8851
5V
BACK UP
0V
POWER ON

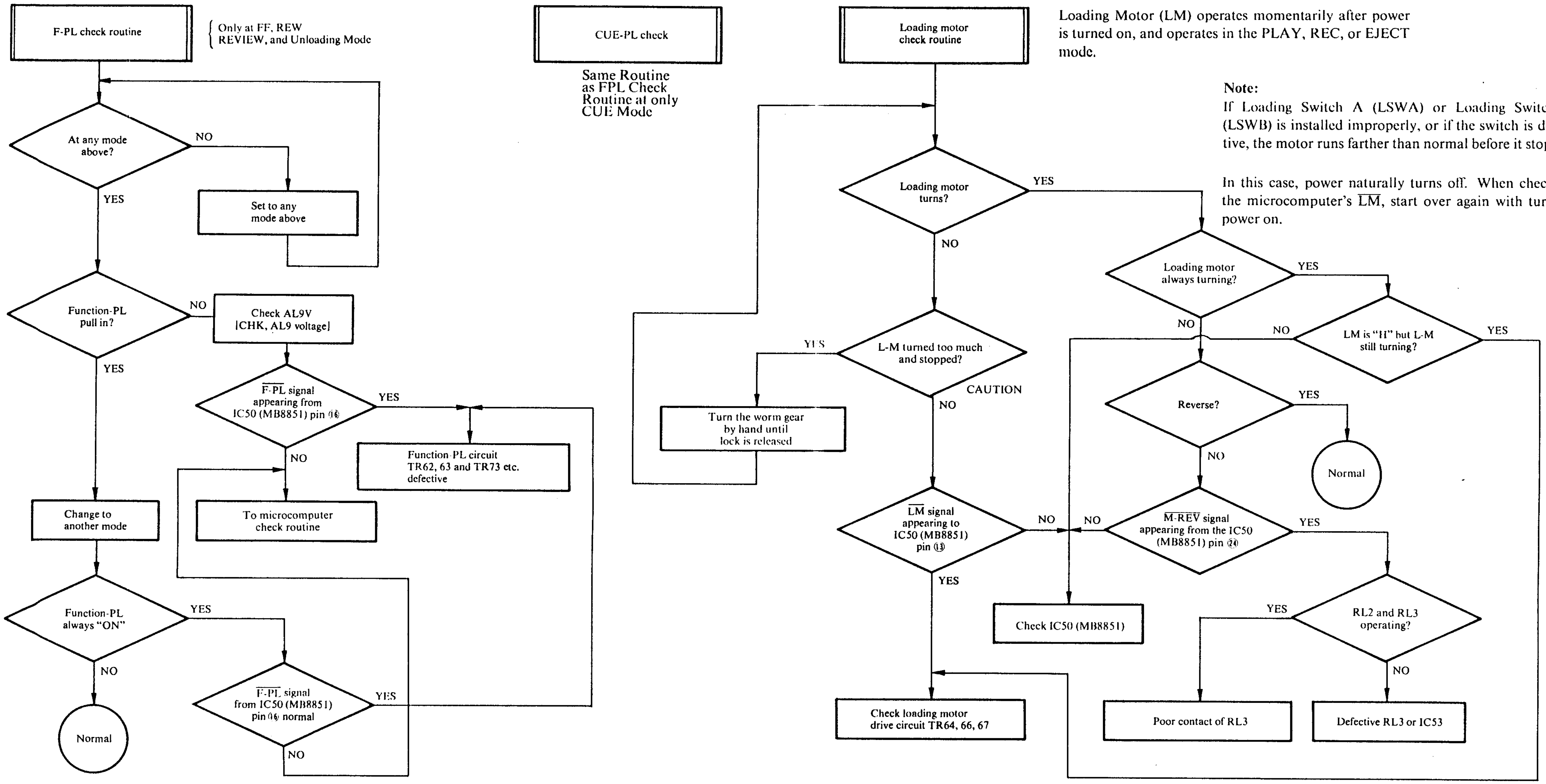

Battery detection circuit check routine
Signal appearing at pin (2) of IC5?
YES
Normal
NO
Appearing signal at pin (5) of IC5?
YES
IC5 defective
NO
Appearing pulses at IC3 ㉑, ㉒?
NO
IC3 (TMS1100) defective
YES
Check D10, D11, etc.


DEW detection check routine
LCD flashing at sometime with power "ON".
DEW sensor getting wet?
YES
After few minutes it will be dry.
NO
Is TR1 (DEW detection) ON?
YES
TR1 or DEW sensor defective
NO
Operation of IC2 OK?
YES
IC3 (TMS-1100) or clock OSC defect
NO
IC2 defective

4. LCD REPAIRING FLOW CHART


LCD indicator check routine
Indicating LCD any thing?
NO
YES
Contents of indication randum?
YES
NO
Power supply (3V) appearing?
YES
NO
Check AL9V
Appearing pulses at IC50 (22) (23) ? (SYSCON PCB)
NO
IC50 (MB8851) defective (SYSCON PCB)
YES
Open circuit between IC50 and LCD unit
Appearing pulses at CE and STD?
NO
YES
LCD unit defective
Counter change to "0000" at counter reset ON?
NO
YES
Backup battery is not charged
No data etc. in LCD indicator
Contents of indication changes?
YES
Normal
NO
Reel pulse of the IC4 pin (4) OK? (DISPLAY PCB)
YES
IC50 MB8851 or pattern defective (SYSCON PCB)
NO
Check REEL PULSE GENERATOR circuit IC4, 5 etc. (DISPLAY PCB)

5. DRIVING CIRCUIT REPAIRING FLOW CHART (SERVO/SYSCON PCB)


F-PL check routine
Only at FF, REW
REVIEW, and Unloading Mode
At any mode above?
NO
Set to any mode above
YES
Function-PL pull in?
NO
Check AL9V
[CHK, AL9 voltage]
F-PL signal appearing from IC50 (MB8851) pin ⑯
YES
Function-PL circuit
TR62, 63 and TR73 etc. defective
NO
To microcomputer check routine
YES
Change to another mode
Function-PL always "ON"
YES
F-PL signal from IC50 (MB8851) pin ⑯ normal
YES
NO
NO
Normal
CUE-PL check
Same Routine
as FPL Check
Routine at only
CUE Mode
Loading motor check routine
Loading motor turns?
YES
NO
L-M turned too much and stopped?
YES
Turn the worm gear by hand until lock is released
CAUTION
NO
LM signal appearing to IC50 (MB8851) pin ⑬
NO
YES
Check loading motor drive circuit TR64, 66, 67
Loading motor always turning?
YES
NO
LM is "H" but L-M still turning?
NO
YES
Reverse?
YES
Normal
NO
M-REV signal appearing from the IC50 (MB8851) pin ㉑
NO
YES
Check IC50 (MB8851)
RL2 and RL3 operating?
YES
NO
Poor contact of RL3
Defective RL3 or IC53

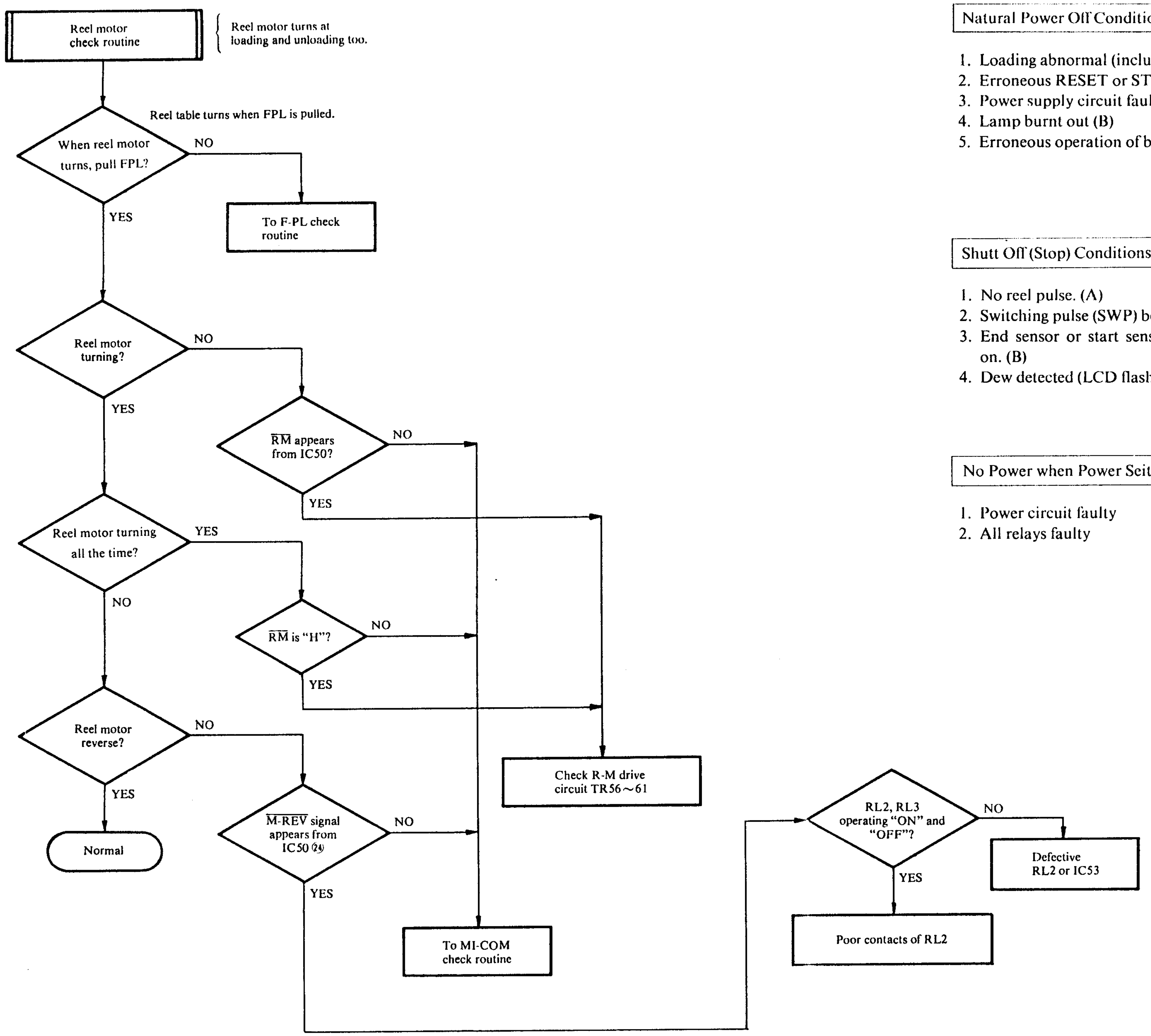
Loading Motor (LM) operates momentarily after power is turned on, and operates in the PLAY, REC, or EJECT mode.

Note:

If Loading Switch A (LSWA) or Loading Switch B (LSWB) is installed improperly, or if the switch is defective, the motor runs farther than normal before it stops.

In this case, power naturally turns off. When checking the microcomputer's $\overline{\text{LM}}$, start over again with turning power on.

6. REPAIRING FLOW CHART (SERVO/SYSCON PCB)


Reel motor check routine
Reel motor turns at loading and unloading too.
Reel table turns when FPL is pulled.
When reel motor turns, pull FPL?
NO
To F-PL check routine
YES
Reel motor turning?
NO
YES
RM appears from IC50?
NO
YES
Reel motor turning all the time?
YES
NO
RM is "H"?
NO
YES
Reel motor reverse?
NO
YES
Normal
Check R-M drive circuit TR56~61
M-REV signal appears from IC50 ㉔
NO
YES
To MI-COM check routine
RL2, RL3 operating "ON" and "OFF"?
NO
YES
Defective RL2 or IC53
Poor contacts of RL2

Natural Power Off Conditions
- A. IC MB8851 sends a power off signal.
- B. IC TMS1100 sends a power off signal.

1. Loading abnormal (including motor failure)
2. Erroneous RESET or STBY operation
3. Power supply circuit fault
4. Lamp burnt out (B)
5. Erroneous operation of battery detection circuit

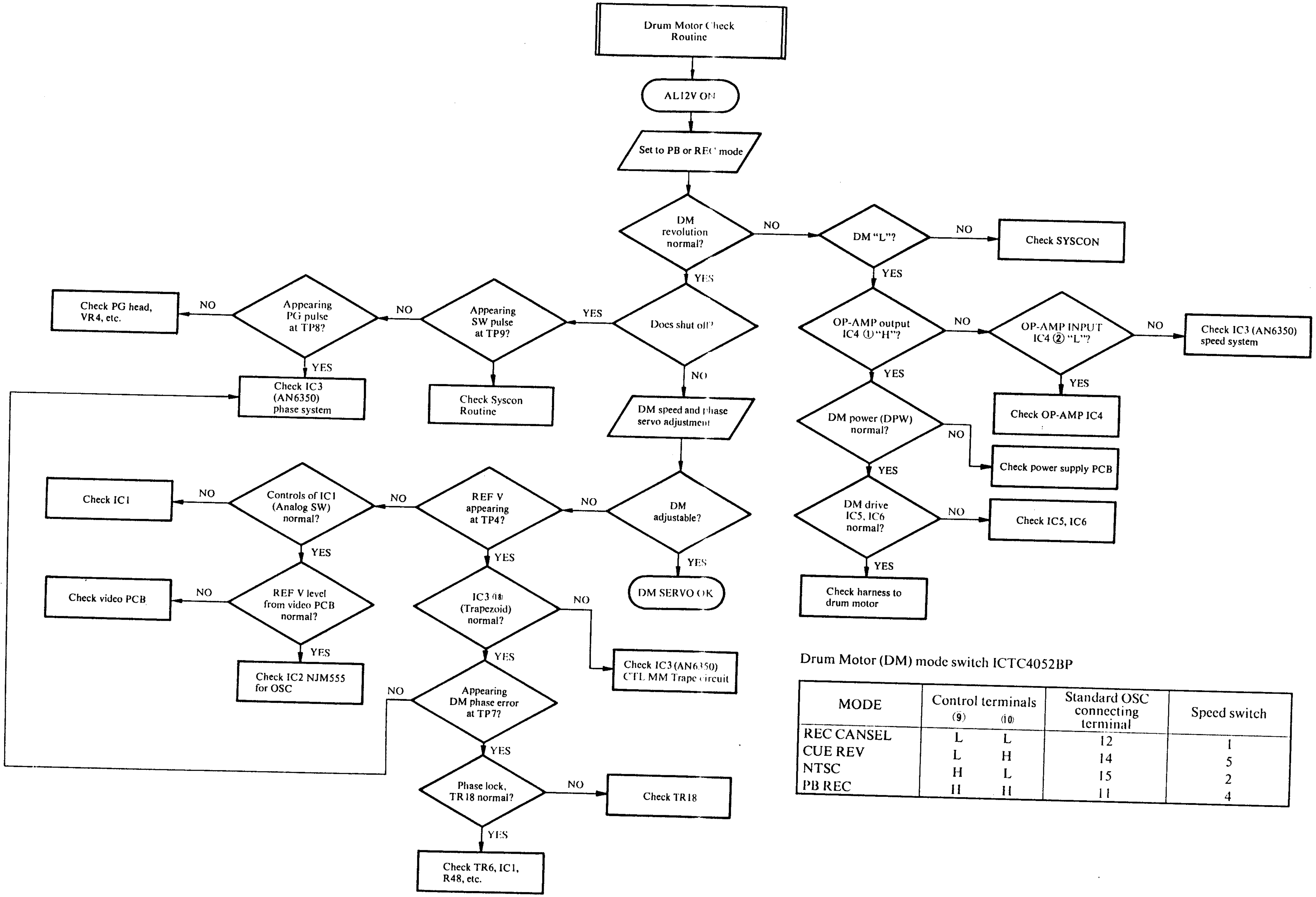
Shutt Off (Stop) Conditions
- A. MB sends a system stop signal.
- B. IC TMS1100 sends a stop signal.

1. No reel pulse. (A)
2. Switching pulse (SWP) below 9 Hz.
3. End sensor or start sensor has operated, or remains on. (B)
4. Dew detected (LCD flashes) (B)

No Power when Power Seitch is Pushed On

1. Power circuit faulty
2. All relays faulty

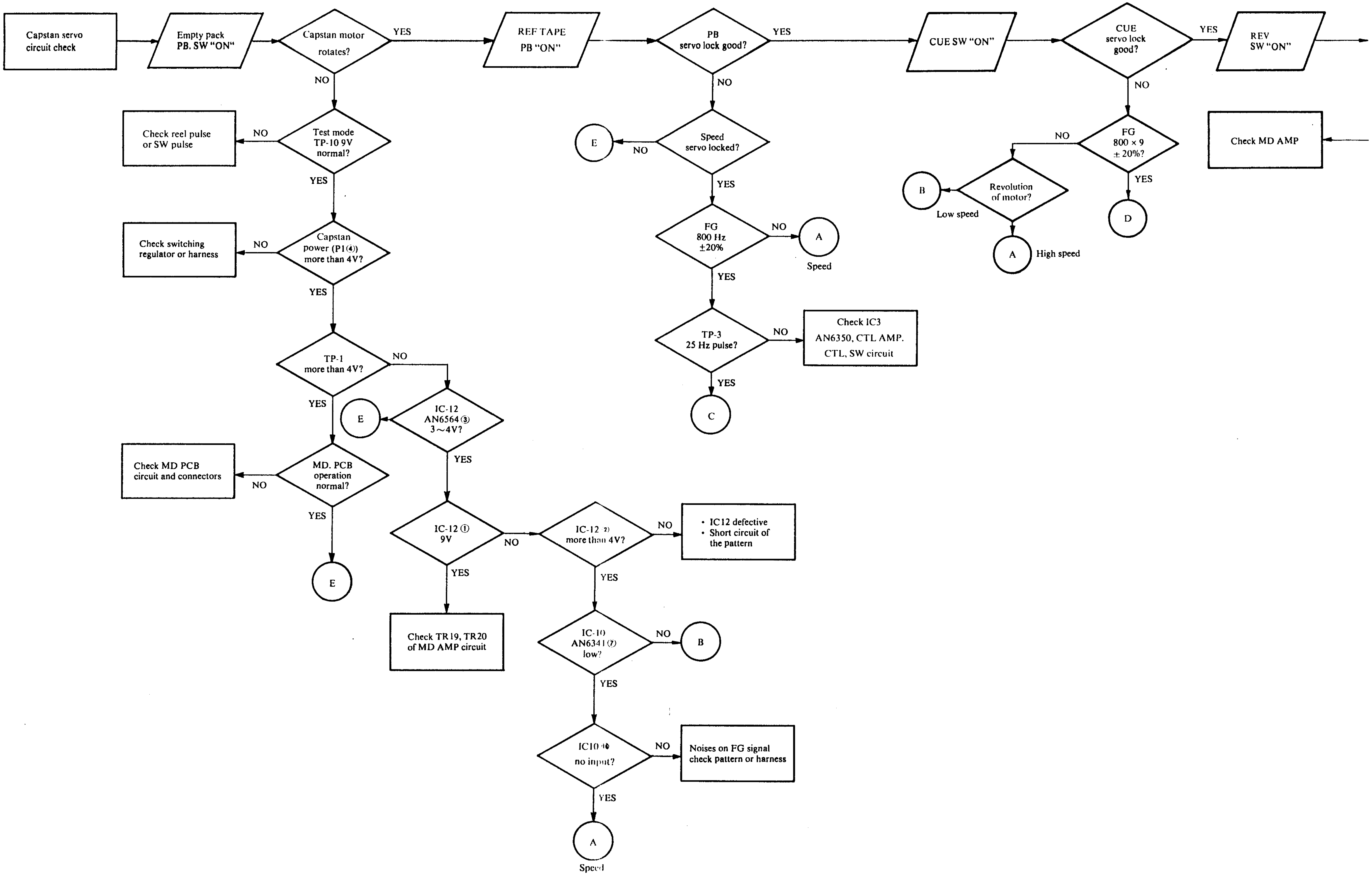
7. DRUM SERVO REPAIRING FLOW CHART (SERVO/SYSCON PCB)

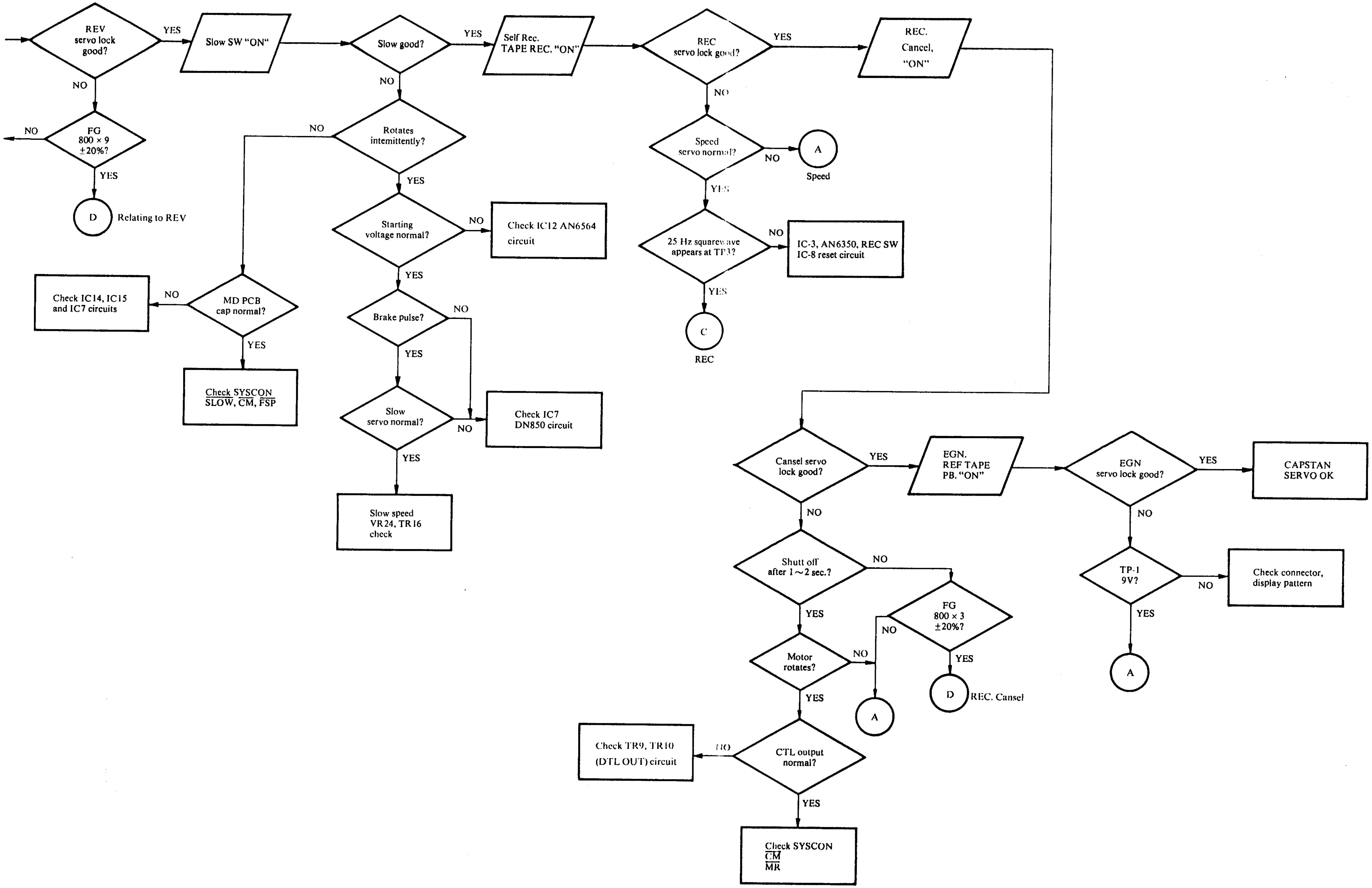

Drum Motor Check Routine
AL12V ON
Set to PB or REC mode
DM revolution normal?
NO
DM "L"?
NO
Check SYSCON
YES
YES
Does shut off?
YES
Appearing SW pulse at TP9?
NO
Appearing PG pulse at TP8?
NO
Check PG head, VR4, etc.
YES
Check IC3 (AN6350) phase system
Check Syscon Routine
NO
DM speed and phase servo adjustment
DM adjustable?
NO
REF V appearing at TP4?
NO
Controls of IC1 (Analog SW) normal?
NO
Check IC1
YES
REF V level from video PCB normal?
NO
Check video PCB
YES
Check IC2 NJM555 for OSC
YES
IC3 ⑱ (Trapezoid) normal?
NO
Check IC3 (AN6350) CTL MM Trape circuit
YES
Appearing DM phase error at TP7?
NO
YES
Phase lock, TR18 normal?
NO
Check TR18
YES
Check TR6, IC1, R48, etc.
YES
DM SERVO OK
OP-AMP output IC4 ①"H"?
NO
OP-AMP INPUT IC4 ② "L"?
NO
Check IC3 (AN6350) speed system
YES
Check OP-AMP IC4
YES
DM power (DPW) normal?
NO
Check power supply PCB
YES
DM drive IC5, IC6 normal?
NO
Check IC5, IC6
YES
Check harness to drum motor

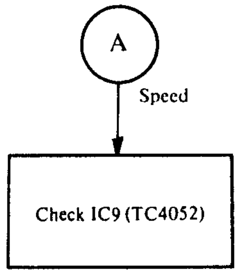
Drum Motor (DM) mode switch ICTC4052BP

MODE	Control terminals ⑨	Control terminals ⑩	Standard OSC connecting terminal	Speed switch
REC CANSEL	L	L	12	1
CUE REV	L	H	14	5
NTSC	H	L	15	2
PB REC	H	H	11	4

8. CAPSTAN SERVO REPAIRING FLOW CHART (SERVO/SYSCON PCB)

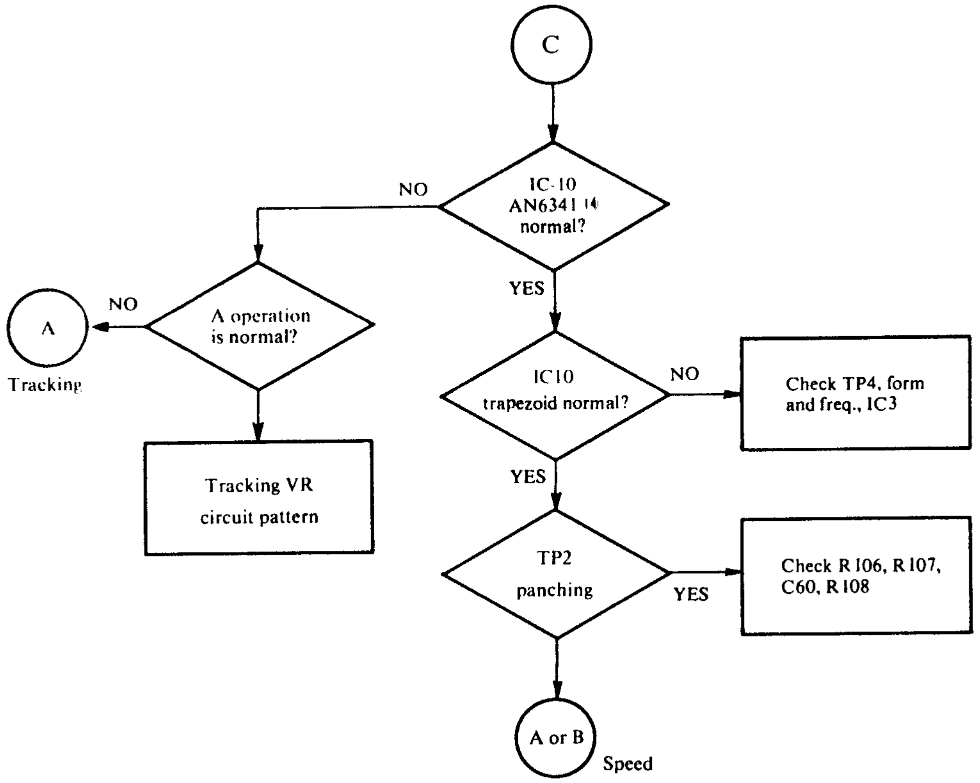

Capstan servo circuit check
Empty pack PB. SW "ON"
Capstan motor rotates?
YES
NO
REF TAPE PB "ON"
PB servo lock good?
YES
NO
CUE SW "ON"
CUE servo lock good?
YES
NO
REV SW "ON"
Check reel pulse or SW pulse
NO
Test mode TP-10 9V normal?
YES
E
NO
Speed servo locked?
YES
NO
FG 800 x 9 ± 20%?
YES
Check MD AMP
B
Revolution of motor?
Low speed
A
High speed
D
Check switching regulator or harness
NO
Capstan power (P1④) more than 4V?
YES
FG 800 Hz ±20%
NO
A
Speed
YES
TP-3 25 Hz pulse?
NO
Check IC3 AN6350, CTL AMP. CTL, SW circuit
YES
C
TP-1 more than 4V?
NO
YES
E
IC-12 AN6564③ 3~4V?
YES
Check MD PCB circuit and connectors
NO
MD. PCB operation normal?
YES
E
IC-12① 9V
NO
IC-12 ② more than 4V?
NO
• IC12 defective
• Short circuit of the pattern
YES
Check TR19, TR20 of MD AMP circuit
YES
IC-10 AN6341⑦ low?
NO
B
YES
IC10 ⑩ no input?
NO
Noises on FG signal check pattern or harness
YES
A
Speed

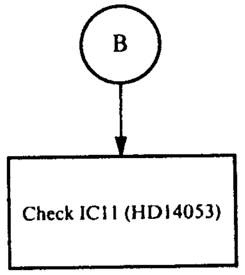

REV servo lock good?
YES
NO
Slow SW "ON"
Slow good?
YES
NO
Self Rec. TAPE REC. "ON"
REC servo lock good?
YES
NO
REC. Cancel, "ON"
FG 800 × 9 ±20%?
NO
YES
D
Relating to REV
Rotates intemittently?
NO
YES
Speed servo normal?
NO
YES
A
Speed
Starting voltage normal?
NO
YES
Check IC12 AN6564 circuit
25 Hz squarewave appears at TP3?
NO
YES
IC-3, AN6350, REC SW IC-8 reset circuit
C
REC
Check IC14, IC15 and IC7 circuits
MD PCB cap normal?
NO
YES
Check SYSCON SLOW, CM, FSP
Brake pulse?
NO
YES
Slow servo normal?
NO
YES
Check IC7 DN850 circuit
Slow speed VR24, TR16 check
Cansel servo lock good?
YES
NO
EGN. REF TAPE PB. "ON"
EGN servo lock good?
YES
NO
CAPSTAN SERVO OK
Shutt off after 1~2 sec.?
NO
YES
TP-1 9V?
NO
YES
Check connector, display pattern
FG 800 × 3 ±20%?
NO
YES
Motor rotates?
NO
YES
A
D
REC. Cansel
A
Check TR9, TR10 (DTL OUT) circuit
NO
CTL output normal?
YES
Check SYSCON CM MR


A
Speed
Check IC9 (TC4052)

Action of Switch Control IC-9 TC4052BP

	A ⑩	B ⑨	INH ⑥
PB	1	1	0
CUE	1	0	0
REV	1	0	0
SLOW STILL	1	1	1
REC	0	0	0
REC PAUSE	1	0	1
REC CANCEL	1	0	0
REC SEARCH	1	0	0
EGN	0	1	0

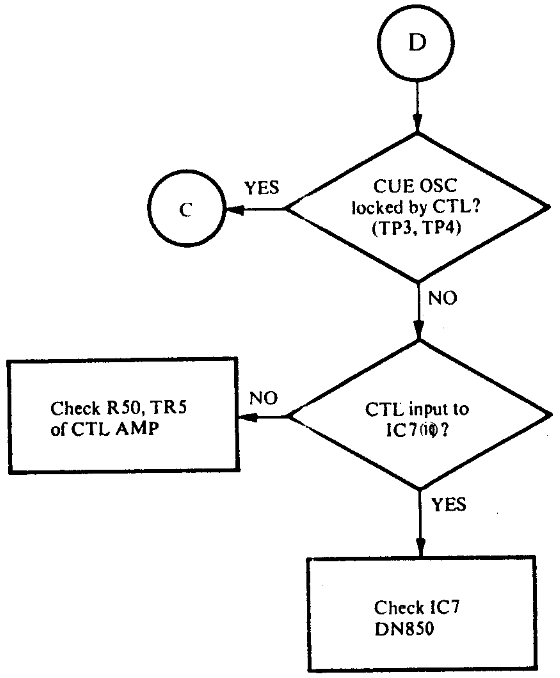

C
IC-10
AN6341 ⑭
normal?
NO
YES
A operation
is normal?
NO
A
Tracking
Tracking VR
circuit pattern
IC10
trapezoid normal?
NO
Check TP4, form
and freq., IC3
YES
TP2
panching
YES
Check R106, R107,
C60, R108
A or B
Speed

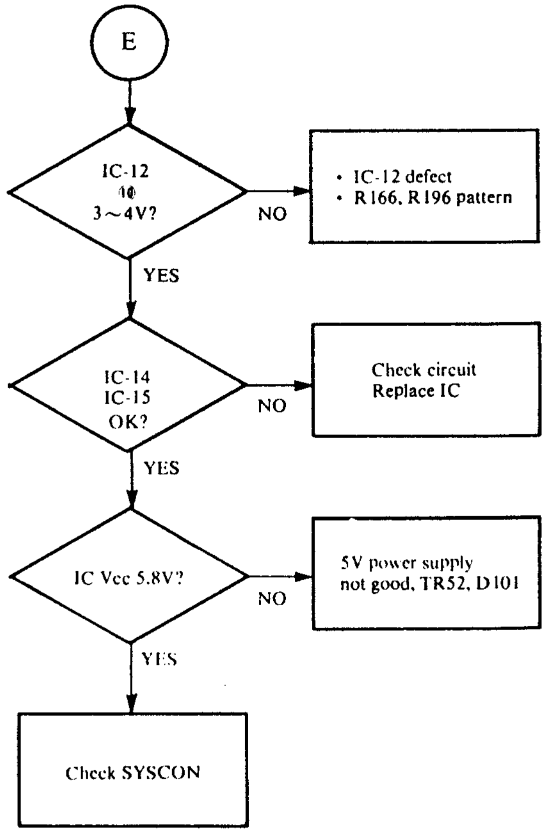

B
Check IC11 (HD14053)

Action of Switch Control IC-11 HD14053BP

	A ⑪	B ⑩ ⑨	IHN
PB	0*	0	0
CUE	1	1	0
REV	1	1	0
SLOW STILL	1	1	1
REC	0*	0	0
REC PAUSE	1	1	1
REC CANCEL	1	1	0
REC SEARCH	1	1	0
EGN	0*	0	0

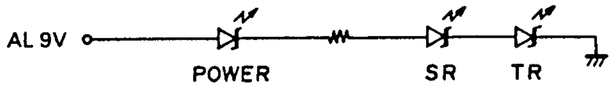
* Become "0" 2 ~ 3 sec after from Servo Lock.


D
CUE OSC
locked by CTL?
(TP3, TP4)
YES
C
NO
CTL input to
IC7⑩?
NO
Check R50, TR5
of CTL AMP
YES
Check IC7
DN850


E
IC-12
⑩
3～4V?
NO
• IC-12 defect
• R166, R196 pattern
YES
IC-14
IC-15
OK?
NO
Check circuit
Replace IC
YES
IC Vcc 5.8V?
NO
5V power supply
not good, TR52, D101
YES
Check SYSCON

9. TROUBLE EXAMPLES

1) Power does not turn on.
   - Fuse burnt out due to contact of an electric circuit with mechanical parts.
   - Microcomputer does not operate normally because the Micorcomputer is not reset
   - RL1 has not operated.
   - Power circuit failure.
2) Dew display is given, and nothing other than eject is performed.
   - If dew display is given, the cause is either actual dew or a peripheral circuit failure.
3) Liquid Crystal Display (LCD) remains unchanged. POWER LED is unlit. Shut off in PLAY or REC mode.
   - Signal source Light Emitting Diode (LED) for reel pulse detecting photo-transistor is unlit.



4) Power does not turn off.
   - RL1 remains on.
5) Power naturally turns off soon after it is on.
   - Mostly caused by the lock of Loading Motor (LM).
6) Wrong operation in the NTSC mode.
   - No PB 9V
7) Cassette Switch (CSW)

   If a CSW failure occurs in the test mode, neither STOP nor EJECT is performed. In the normal mode, the same condition as that of EJECT occurs.
8) Loading Switch A (LSW A), Loading Switch B (LSW B).

   If an LSW failure occurs, the loading motor operates abnormally when VA-88 or VU-88 power is turned on, and is locked still, and power is turned off.
9) End Sensor (ES)

   Start Sensor (SS)

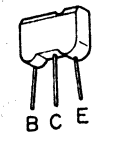
   If ES or SS photo-transistor is faulty, the Fast Forward or Rewind mode is induced as soon as a cassette tape is inserted, and remains as this mode.

XI. CLASSIFICATION OF VARIOUS P.C BOARDS

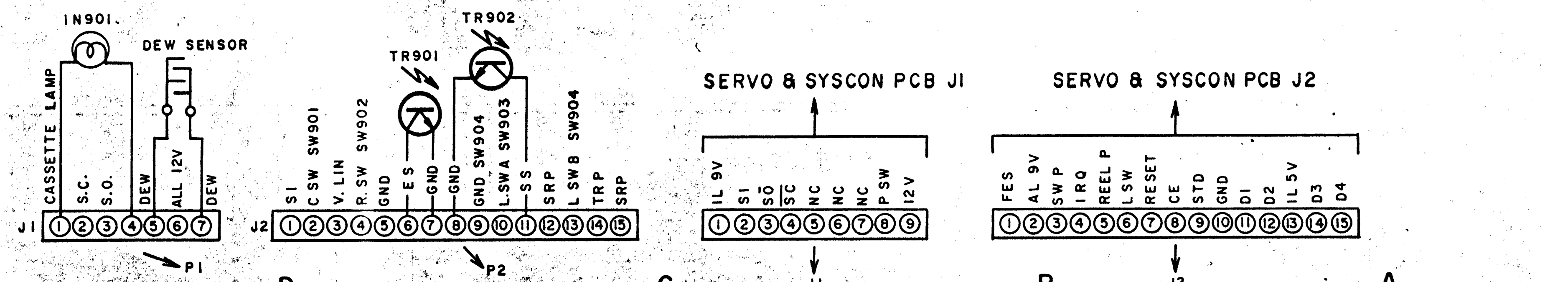
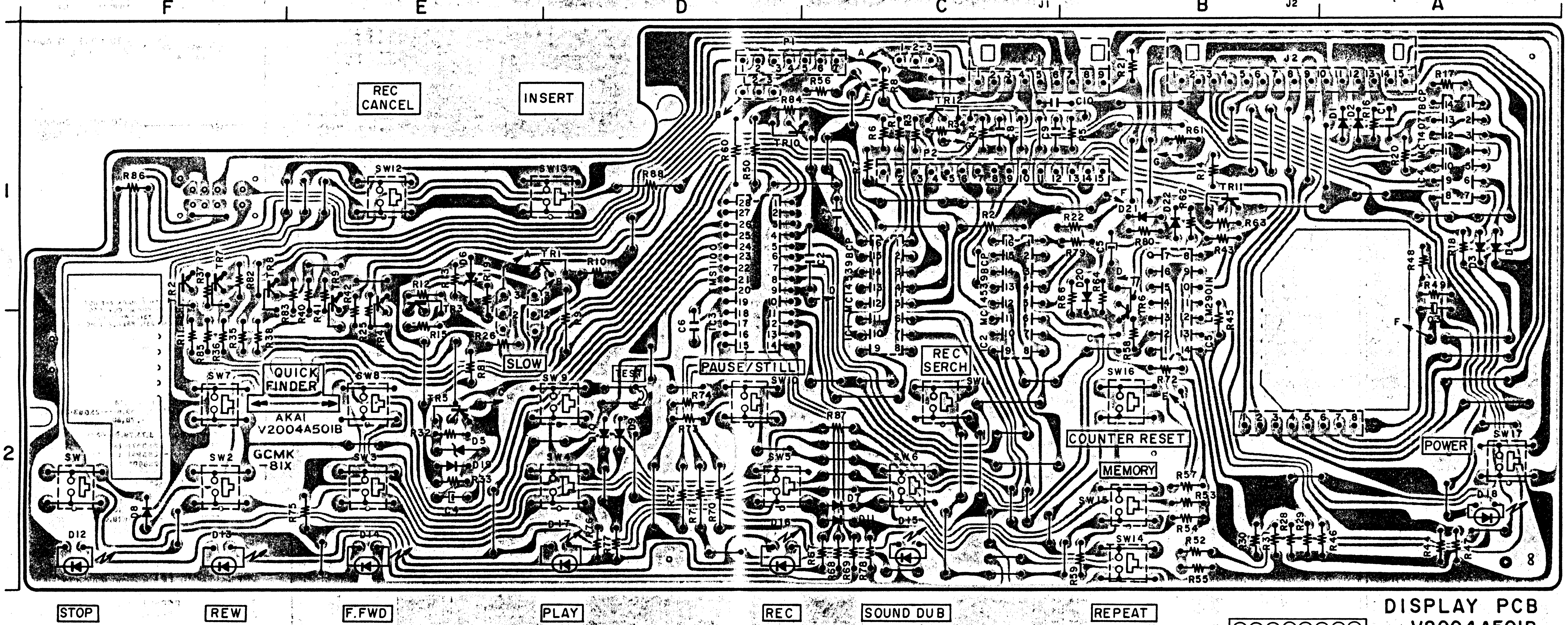
1. P.C BOARDS TITLES AND IDENTIFICATION NUMBERS

P.C Board Title	P.C Board Number
Servo/Syscon P.C Board	V2004A501A
Display P.C Board	V2004A501B
Video Chroma P.C Board	V2004A502A
Video Y P.C Board	V2004A502B
Power/Audio P.C Board	V2004A502C
Jack P.C Board	V2004C5030
Sensor (R) P.C Board	V2004D5060
Sensor (L) P.C Board	V2004D5070
Rotary Detection (S) P.C Board	V2004D5090
Rotary Detection (TU) P.C Board	V2004D5100
CM Drive P.C Board	V2004D5110
Solenoid P.C Board	V2004D5120
Mic Jack P.C Board	V2004D5130
Sub Shutt Off P.C Board	V2004D5140

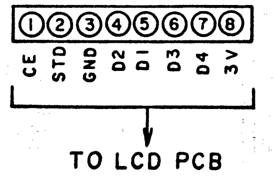
2) DISPLAY P.C BOARD V2004A501B



2SD636
2SB641



IN901
CASSETTE LAMP
DEW SENSOR
J1
① S.C. ② S.O. ③ ④ DEW ⑤ ⑥ ALL 12V ⑦ DEW
P1
TR901
TR902
J2
① SI ② C SW SW901 ③ V. LIN ④ R. SW SW902 ⑤ GND ⑥ E S ⑦ GND ⑧ GND ⑨ GND SW904 ⑩ L.SWA SW903 ⑪ S S ⑫ SRP ⑬ L SWB SW904 ⑭ TRP ⑮ SRP
P2
SERVO & SYSCON PCB J1
① IL 9V ② SI ③ SO ④ SC ⑤ NC ⑥ NC ⑦ NC ⑧ P SW ⑨ 12V
J1
SERVO & SYSCON PCB J2
① FES ② AL 9V ③ SW P ④ IRQ ⑤ REEL P ⑥ L SW ⑦ RESET ⑧ CE ⑨ STD ⑩ GND ⑪ DI ⑫ D2 ⑬ IL 5V ⑭ D3 ⑮ D4
J2
F
E
D
C
B
A
1
2
REC CANCEL
INSERT
QUICK FINDER
AKAI V2004A501B
GCMK-81X
SLOW
TEST
PAUSE/STILL
REC SERCH
COUNTER RESET
MEMORY
POWER
SW1
SW2
SW3
SW4
SW5
SW6
SW7
SW8
SW9
SW10
SW11
SW12
SW13
SW14
SW15
SW16
SW17
TR1
TR2
TR3
TR5
TR6
TR7
TR8
TR10
TR11
TR12
IC1 MC14398CP
IC2 MC14539BCP
MSI100
MC14077BCP
LM2901N
D1
D2
D3
D4
D5
D6
D7
D8
D11
D12
D13
D14
D15
D16
D17
D18
D19
D20
D21
D22
R2
R3
R6
R8
R9
R10
R12
R15
R17
R18
R20
R21
R22
R26
R28
R29
R30
R31
R32
R33
R35
R36
R37
R38
R41
R43
R45
R46
R48
R49
R50
R52
R53
R54
R55
R56
R57
R58
R59
R60
R61
R62
R63
R64
R66
R68
R69
R70
R72
R73
R74
R75
R76
R77
R78
R79
R80
R82
R83
R84
R85
R86
R87
R88
C1
C2
C3
C5
C6
C10
STOP
REW
F.FWD
PLAY
REC
SOUND DUB
REPEAT

DISPLAY PCB
V2004A501B


① CE ② STD ③ GND ④ D2 ⑤ DI ⑥ D3 ⑦ D4 ⑧ 3V

TO LCD PCB

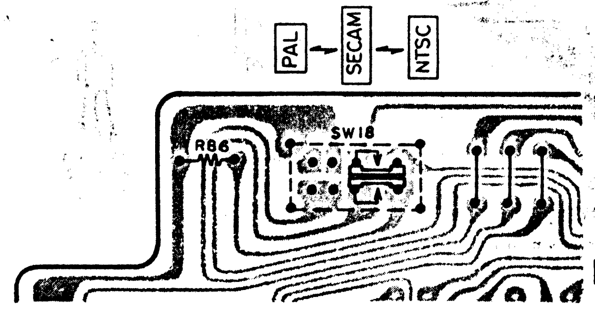
TR 1, 2, 4 7 to 11 2SD636 (Q, R, S, T)

TR3, 5, 6, 12 2SB641 (Q, R, S)

LOCATION OF IC & TR

IC1 . . . . C1,2
IC2 . . . . C1,2
IC3 . . . . D1
IC4 . . . . A1
IC5 . . . . B1,2

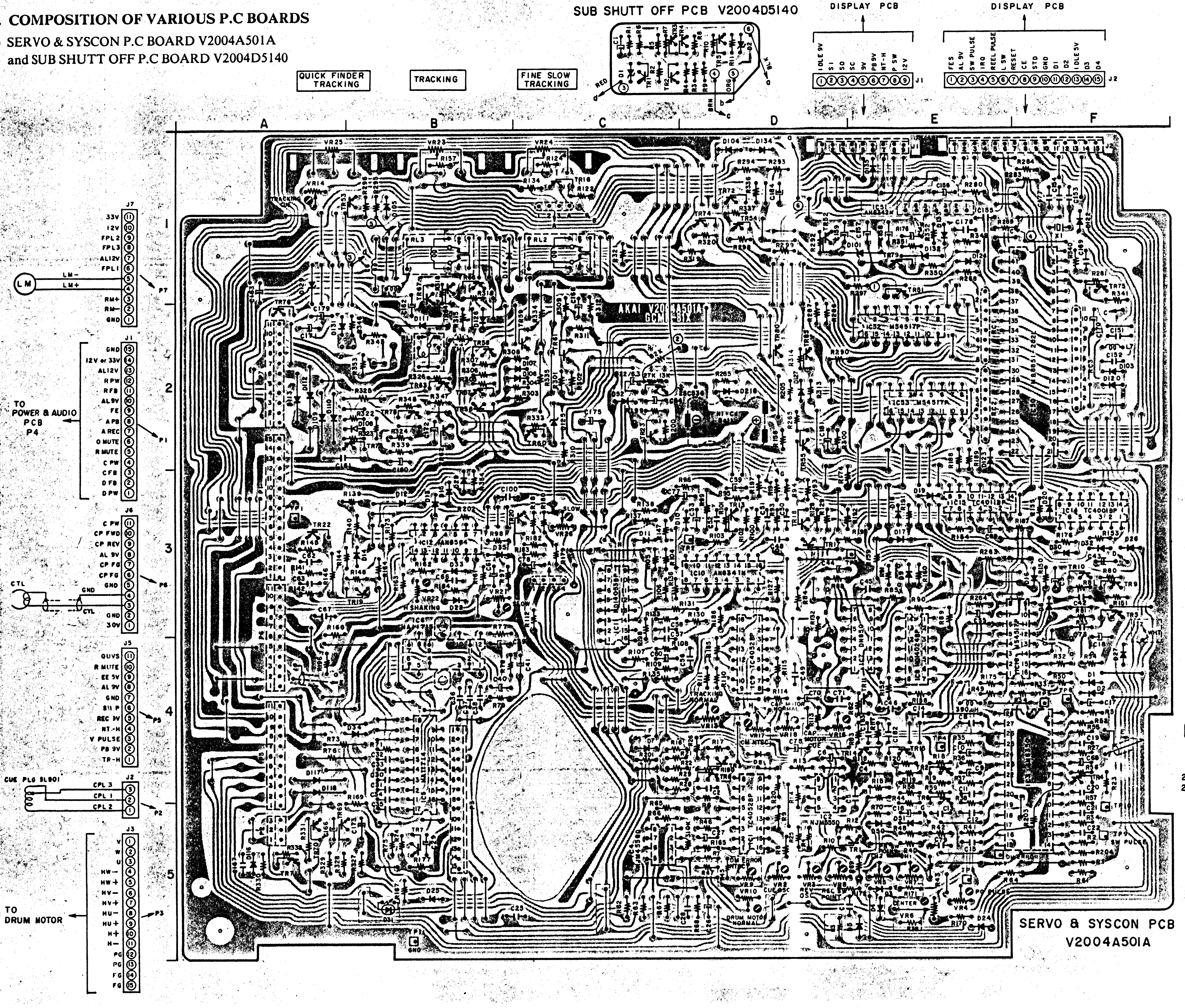
TR1. . . . . D1
TR2. . . . . F1
TR3. . . . . E1
TR4. . . . . E1
TR5. . . . . E2
TR6. . . . . B1
TR7. . . . . F1
TR8. . . . . E1
TR9. . . . . E1
TR10. . . . . . . C1
TR11. . . . . . . B1
TR12. . . . . . . C1


PAL
SECAM
NTSC
R86
SW18

EGN MODEL ONLY

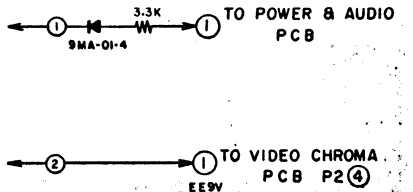
2. COMPOSITION OF VARIOUS P.C BOARDS

1) SERVO & SYSCON P.C BOARD V2004A501A and SUB SHUTT OFF P.C BOARD V2004D5140


SUB SHUTT OFF PCB V2004D5140
RED
BRN
BLK
ORG
DISPLAY PCB
IDLE 9V
S1
SO
SC
9V
PB 9V
NT-H
P SW
12V
J1
DISPLAY PCB
FES
AL 9V
SW PULSE
IRQ
REEL PULSE
L SW
RESET
CE
STD
GND
D1
D2
IDLE 5V
D3
D4
J2
QUICK FINDER TRACKING
TRACKING
FINE SLOW TRACKING
A
B
C
D
E
F
1
2
3
4
5
J7
33V ⑪
12V ⑩
FPL2 ⑨
FPL3 ⑧
AL12V ⑦
FPL1 ⑥
LM
LM- ⑤
LM+ ④
RM+ ③
RM- ②
GND ①
P7
J1
GND ⑮
12V or 33V ⑭
AL12V ⑬
RPW ⑫
RFB ⑪
AL9V ⑩
FE ⑨
APB ⑧
A REC ⑦
O MUTE ⑥
R MUTE ⑤
C PW ④
CFB ③
DFB ②
DPW ①
P1
TO POWER & AUDIO PCB P4
J6
C PW ⑪
CP FWD ⑩
CP REV ⑨
AL 9V ⑧
CP FG ⑦
CP FG ⑥
GND ⑤
CTL
GND ④
CYL ③
GND ②
30V ①
P6
J5
QUVS ⑪
R MUTE ⑩
EE 5V ⑨
AL 9V ⑧
GND ⑦
S\\ P ⑥
REC 9V ⑤
NT-H ④
V PULSE ③
PB 9V ②
TR-H ①
P5
CUE PLG SL901
J2
CPL 3 ③
CPL 1 ②
CPL 2 ①
P2
J3
V ①
W ②
U ③
HW- ④
HW+ ⑤
HV- ⑥
HV+ ⑦
HU- ⑧
HU+ ⑨
H+ ⑩
H- ⑪
PG ⑫
PG ⑬
FG ⑭
FG ⑮
P3
TO DRUM MOTOR
AKAI V2004A501A
TRACKING NORMAL
CM NTSC
CAP MOTOR NORMAL
DRUM MOTOR NORMAL
CUE OSC
REC SW POINT
CENTER
SW PULSE
PG PULSE
TP1
GND
SERVO & SYSCON PCB V2004A501A

LOCATION OF IC & TR

IC1, 2	D5	TR13	D3
IC3	F4	TR14, 15	E4
IC4	C5	TR16	C1
IC5	B4	TR17, 18	D3
IC6	B4	TR19	A,B3
IC7, 8	E3, 4	TR20	B3
IC9	D3, 4	TR22	A3
IC10	D3	TR23	C2
IC11	C3	TR51	E1
IC12	B3	TR52	D1
IC14	F3	TR53	A1
IC15	E3	TR54	D1
IC16	F4	TR55	D2
		TR56, 57, 58	B2
IC50	F2	TR59, 60, 61	C2
IC52, 53	E2	TR62, 63, 64	B2
		TR66, 67	B1
TR1	A1	TR69, 70, 71	A5
TR2	E4	TR72	D1
TR3	D4	TR73	B2
TR4	F4	TR74	D1
TR5	F3	TR75	F1
TR6	E5	TR76	A2
TR7	B5	TR78	B2
TR9, 10	F3	TR79	E1
TR11	E11	TR80, 85	D2

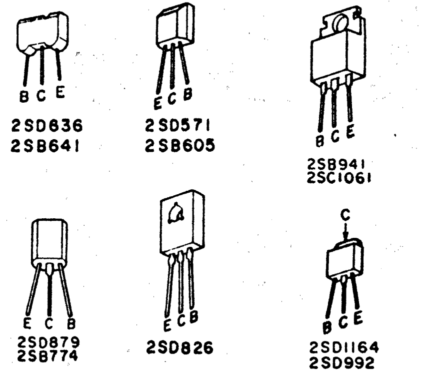

3.3K
①
9MA-01-4
①
TO POWER & AUDIO PCB
②
①
EE9V
TO VIDEO CHROMA PCB P2④

NOTE : PARTS WITH & MARK ARE NOT MECESSARY FOR MI-CON IC50 (MB8851M-231L) WHEN USE MB8851M-231L PREASE REMOVE THEM.

[- - -] EGN MODEL ONLY

TR1 to 7, 9, 10, 13 to 15, 17, 18
23, 51 to 53, 56 to 59, 61 ---2SD636 (Q,R,S)
64, 74, 78, 80

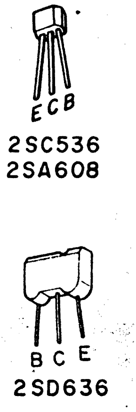
TR11, 16, 20, 70, 73, 75, 79, 85---2SB641 (Q,R,S)
TR19-------2SD571 (K,L,M)
TR22-------2SB941 (Q,R,S)
TR54,55-----2SB605 (K,L,M)
TR60,67-----2SD879
TR62,66,69---2SD1164 (K,L,M)
TR63-------2SD992 (K,L,M)
TR71-------2SD826 (E,F,G)
TR72-------2SB774 (Q,R,S)
TR76-------2SC1061 (B,C,D)

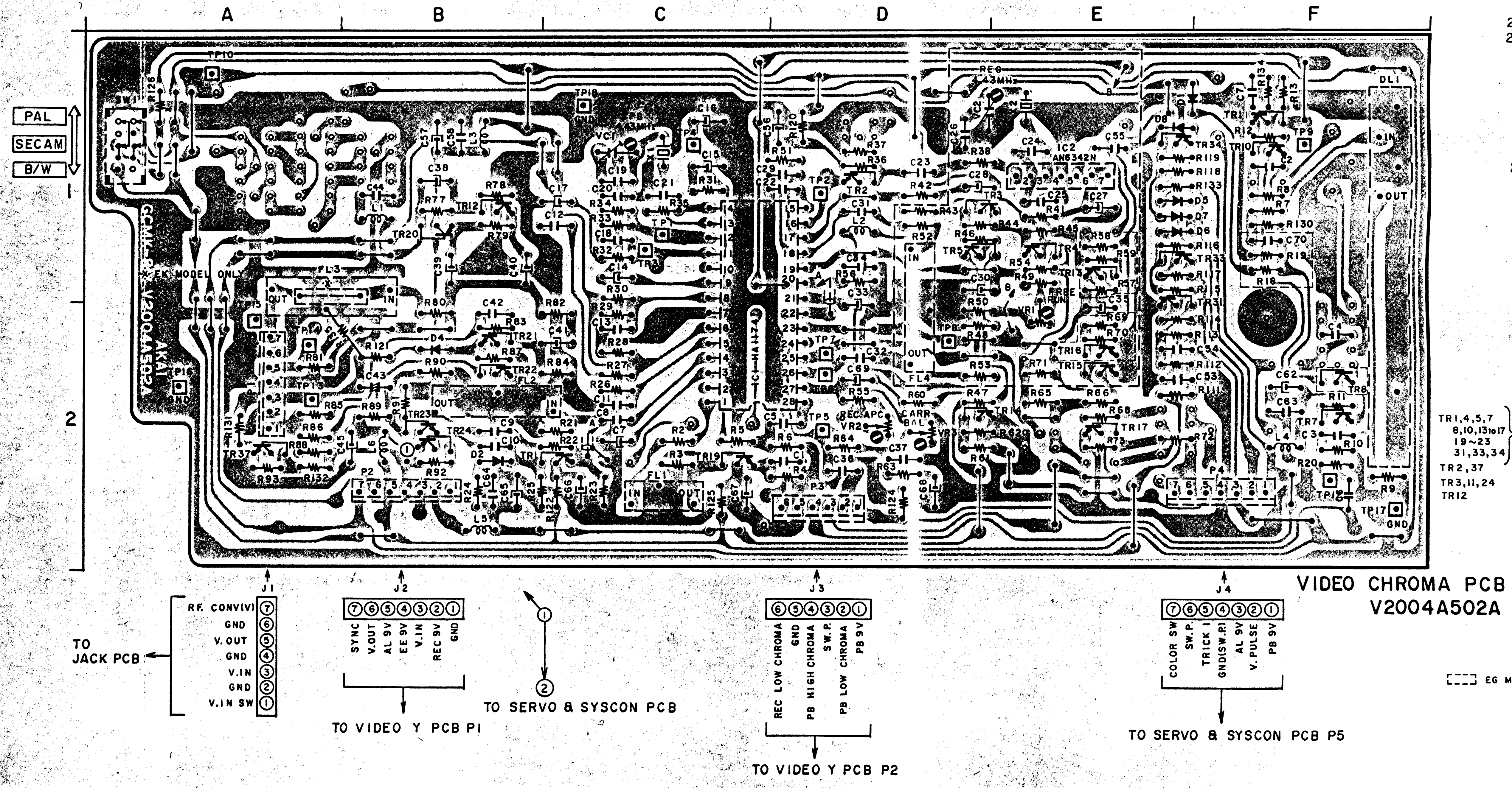

B C E
2SD636
2SB641
E C B
2SD571
2SB605
B C E
2SB941
2SC1061
E C B
2SD879
2SB774
E C B
2SD826
C
B C E
2SD1164
2SD992

3) VIDEO CHROMA P.C BOARD V2004A502A (EG/EK/EA)

LOCATION OF IC & TR

IC1	C2
IC2	E1
TR1	B2
TR2	D1
TR3	D1
TR4	E1
TR5	D2
TR7	F2
TR8	F2
TR10	F1
TR11	F1
TR12	B1
TR13	E2
TR14	D14
TR15	E15
TR16	E15
TR17	E15
TR19	C2
TR20	B1
TR21	B2
TR22	B2
TR23	B2
TR24	B2
TR31	E2
TR33	E2
TR34	E1
TR37	A2


ECB
2SC536
2SA608
BCE
2SD636


A
B
C
D
E
F
1
2
PAL
SECAM
B/W
SW1
TP10
TP18
TP8
TP1
TP2
TP7
TP5
TP9
TP12
TP17
GND
TP13
TP15
TP16
EK MODEL ONLY
AKAI V2004A502A
IC1 HA11174
IC2 AN6342N
REC 4.43MHz
VCO
DL1
IN
OUT
FL1
FL2
FL3
FL4
VR1 FREE RUN
VR2 REC APC
VR3 CARR BAL
P2
P3
P4
J1
J2
J3
J4
VIDEO CHROMA PCB
V2004A502A
RF. CONV(V) ⑦
GND ⑥
V.OUT ⑤
GND ④
V.IN ③
GND ②
V.IN SW ①
TO JACK PCB
⑦⑥⑤④③②①
SYNC
V.OUT
AL 9V
EE 9V
V.IN
REC 9V
GND
TO VIDEO Y PCB P1
①
②
TO SERVO & SYSCON PCB
⑥⑤④③②①
REC LOW CHROMA
GND
PB HIGH CHROMA
SW.P.
PB LOW CHROMA
PB 9V
TO VIDEO Y PCB P2
⑦⑥⑤④③②①
COLOR SW
SW.P.
TRICK I
GND(SW.P.)
AL 9V
V.PULSE
PB 9V
TO SERVO & SYSCON PCB P5

TR1,4,5,7 8,10,13to17 19~23 31,33,34	2SC536SP (D,E,F,G)
TR2,37	2SD636 (P,Q,R)
TR3,11,24	2SA608SP (D,E,F,G)
TR12	2SA608SP (F)

[‑‑‑] EG MODEL ONLY

4) VIDEO CHROMA P.C BOARD V2004A502A (EGN)

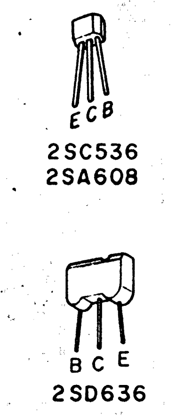
LOCATION OF IC & TR

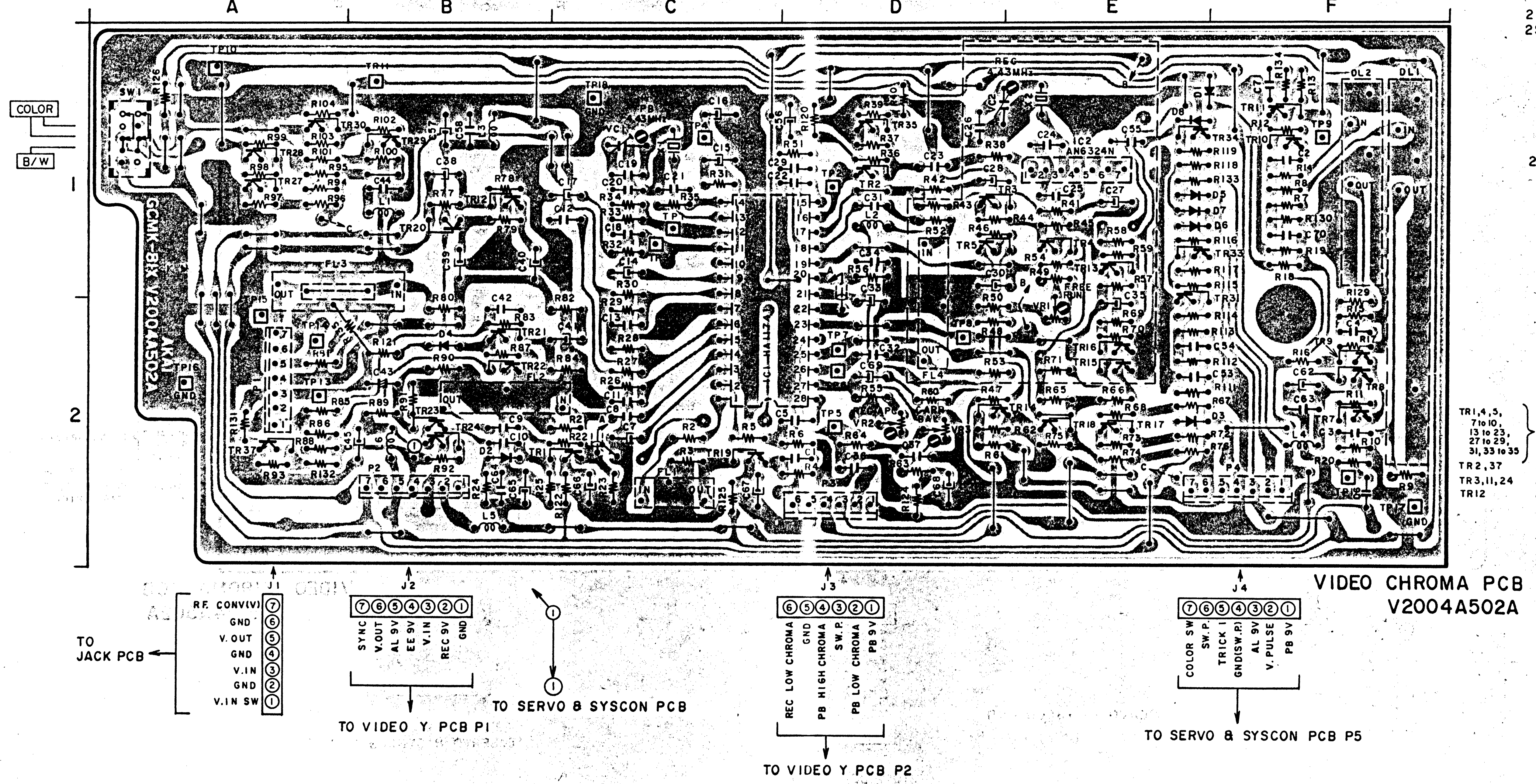
IC1 .... C2
IC2 .... E1

TR1 .... B2
TR2 .... D1
TR3 .... D1
TR4 .... E1
TR5 .... D2
TR7 .... F2
TR8 .... F2
TR9 .... E2

TR10 .... F1
TR11 .... F1
TR12 .... B1
TR13 .... E2
TR14 .... D14
TR15 .... E15
TR16 .... E15
TR17 .... E15
TR18 .... E2
TR19 .... C2
TR20 .... B1
TR21 .... B2

TR22 .... B2
TR23 .... B2
TR24 .... B2
TR27 .... A1
TR28 .... A1
TR29 .... B1
TR30 .... A1
TR31 .... E2
TR33 .... E2
TR34 .... E1
TR35 .... D1
TR37 .... A2

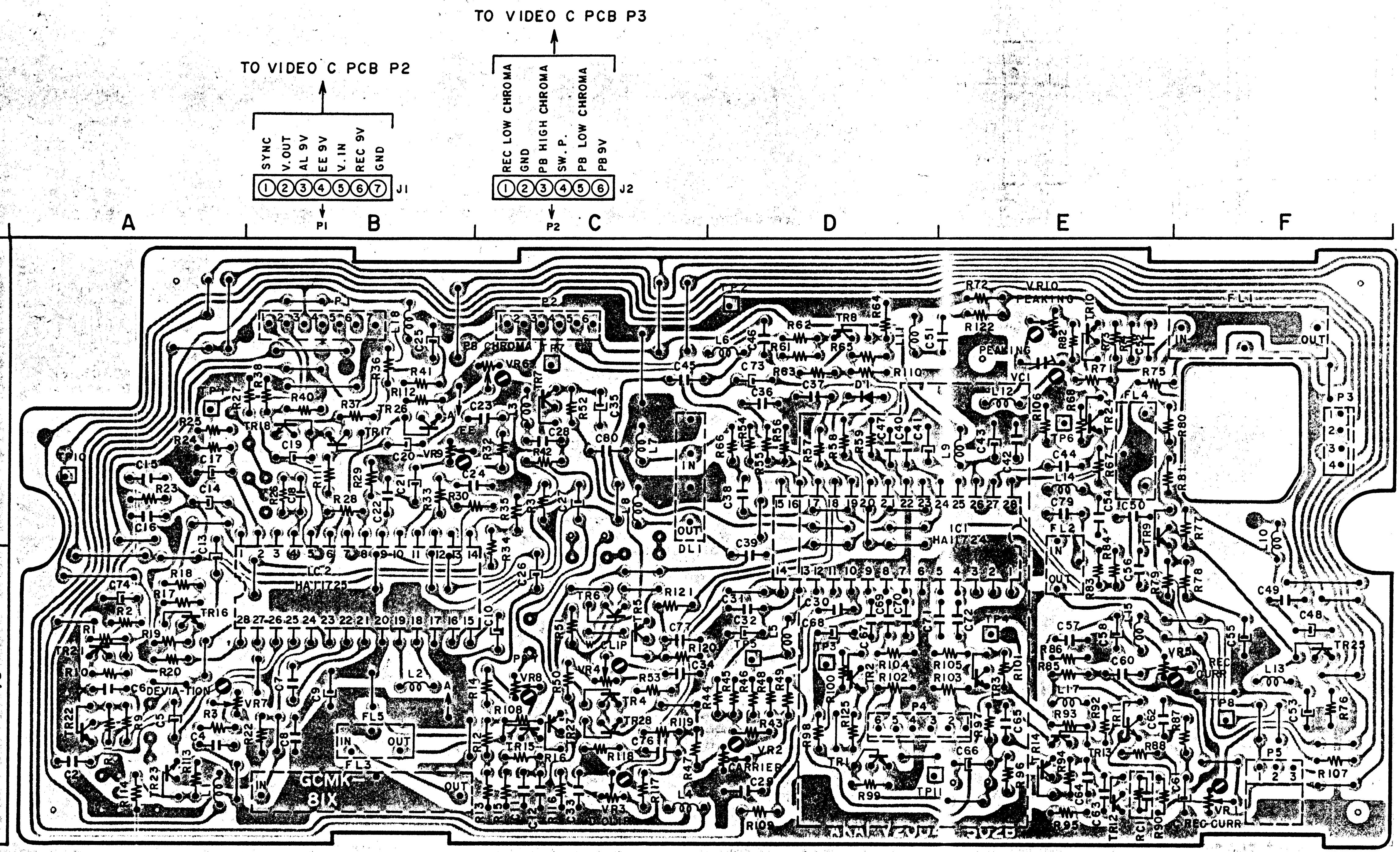

E C B
2SC536
2SA608
B C E
2SD636

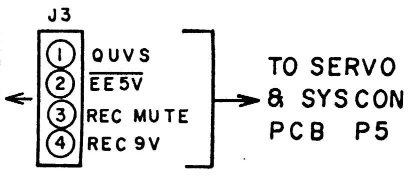

A
B
C
D
E
F
1
2
COLOR
B/W
SW1
GCM - B X V2004A502A AKAI
IC1 HA1172
IC2 AN6324N
REC 4.43MHz
FL3
FL4
VR1
VR2
J1
R.F. CONV(V) ⑦
GND ⑥
V.OUT ⑤
GND ④
V.IN ③
GND ②
V.IN SW ①
TO JACK PCB
J2
⑦⑥⑤④③②①
SYNC
V.OUT
AL 9V
EE 9V
V.IN
REC 9V
GND
TO VIDEO Y PCB P1
①
TO SERVO & SYSCON PCB
J3
⑥⑤④③②①
REC LOW CHROMA
GND
PB HIGH CHROMA
SW.P.
PB LOW CHROMA
PB 9V
TO VIDEO Y PCB P2
J4
⑦⑥⑤④③②①
COLOR SW
SW.P.
TRICK I
GND(SW.P.)
AL 9V
V.PULSE
PB 9V
TO SERVO & SYSCON PCB P5

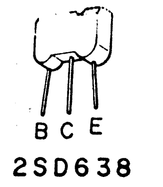
VIDEO CHROMA PCB
V2004A502A

TR1,4,5, 7 to 10, 13 to 23, 27 to 29, 31, 33 to 35 } 2SC536SP (D,E,F,G)
TR2,37 2SD636 (P,Q,R)
TR3,11,24 2SA608SP (D,E,F,G)
TR12 2SA608SP (F)

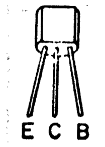
5) VIDEO Y P.C BOARD V2004A502B


TO VIDEO C PCB P2
SYNC
V.OUT
AL 9V
EE 9V
V.IN
REC 9V
GND
①②③④⑤⑥⑦ J1
P1
TO VIDEO C PCB P3
REC LOW CHROMA
GND
PB HIGH CHROMA
SW. P.
PB LOW CHROMA
PB 9V
①②③④⑤⑥ J2
P2
A
B
C
D
E
F
1
2
IC1 HA11724
IC2 HA11725
GCMK-81X
PB CHROMA
PEAKING
DEVIATION
CLIP
CARRIER
REC CURR
FL1
FL2
FL3
FL4
FL5
DL1
IN
OUT

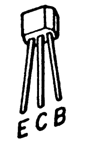

J3
① QUVS
② EE 5V
③ REC MUTE
④ REC 9V
TO SERVO
& SYSCON
PCB P5



2SD638



2SC1047



2SA608
2SC536

TR1 to 3_____2SD638 (P,Q,R)
TR4,13,28___2SC536SP (F)
TR5,6,14____2SA608SP (F)
TR7,21,27___2SA608SP (D,E,F,G)
TR8,9,12
16to18
22to26 ___2SC536SP (D,E,F,G)
TR10,11____2SC1047 (D,E)
TR15_______2SA608SP (F,G)

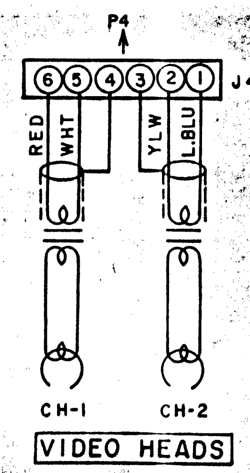
LOCATION OF IC & TR

IC1-----D1
IC2-----B2

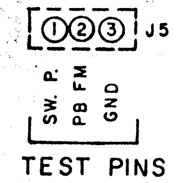
TR1----D2
TR2----D2
TR3-----E2
TR4-----C2
TR5----C2
TR6-----C2
TR7-----C1

TR8----D1
TR9-----E1
TR11----E2
TR12----E2
TR13----E2
TR14----E2
TR15----C2
TR16----A2
TR17----B1
TR18----B1

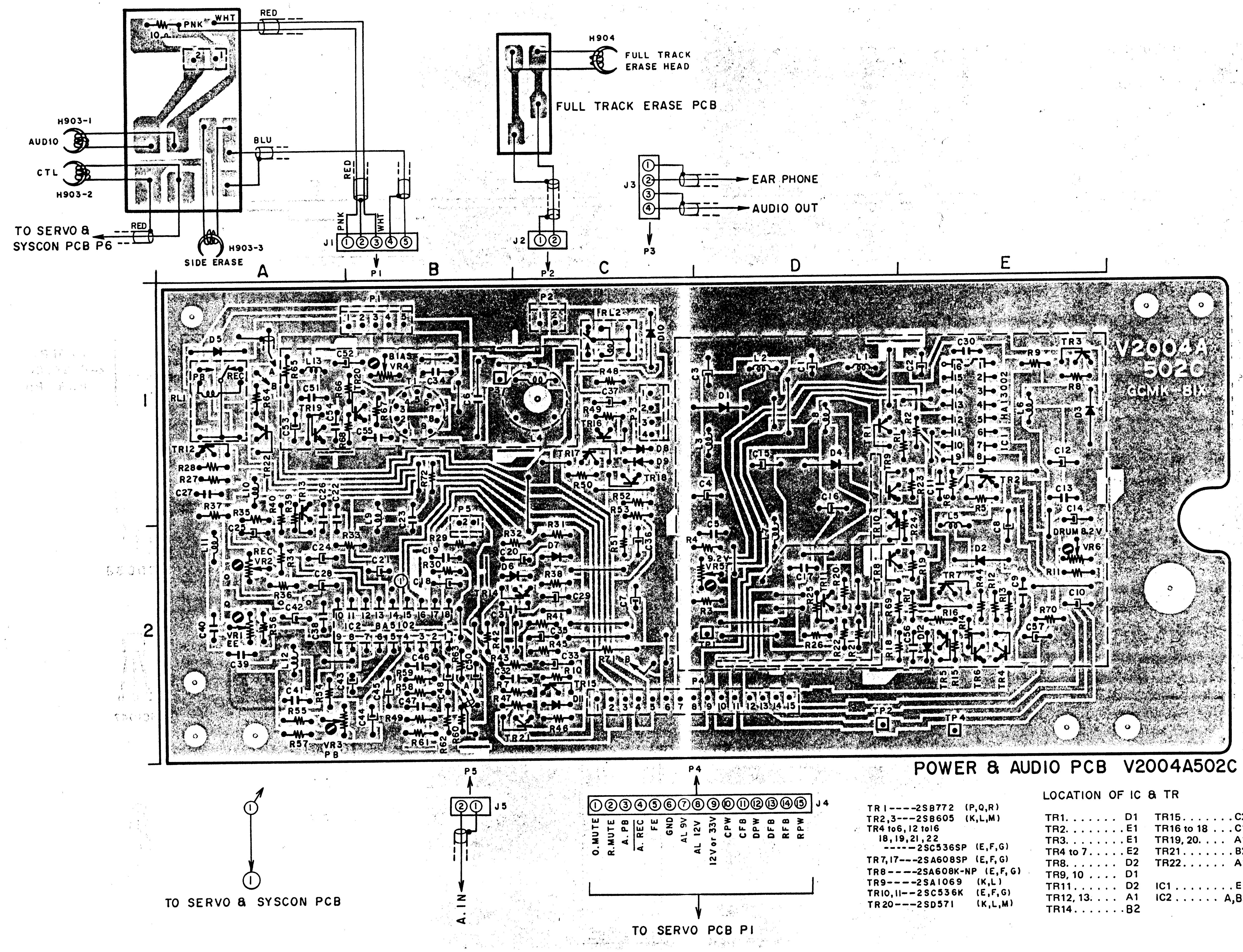
TR21----A2
TR22----A2
TR23----A2
TR24----E1
TR25----F2
TR26----B1
TR27----C2
TR28----C2


P4
⑥⑤④③②① J4
RED
WHT
YLW
L.BLU
CH-1
CH-2
VIDEO HEADS

VIDEO Y PCB
V2004A502B


①②③ J5
SW. P.
PB FM
GND
TEST PINS

6) POWER & AUDIO P.C BOARD V2004A502C

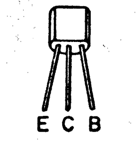

RED
PNK
WHT
10
H903-1
AUDIO
CTL
H903-2
BLU
TO SERVO &
SYSCON PCB P6
RED
H903-3
SIDE ERASE
RED
PNK
WHT
J1 ① ② ③ ④ ⑤
P1
H904
FULL TRACK
ERASE HEAD
FULL TRACK ERASE PCB
J2 ① ②
P2
J3 ① ② ③ ④
EAR PHONE
AUDIO OUT
P3
A
B
C
D
E
1
2
V2004A
502C
GCMK-B1X
P5
J5 ② ①
A. IN
①
①
TO SERVO & SYSCON PCB
P4
J4 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮
O.MUTE
R.MUTE
A.PB
A.REC
FE
GND
AL 9V
AL 12V
12V or 33V
CPW
CFB
DPW
DFB
RFB
RPW
TO SERVO PCB P1

POWER & AUDIO PCB V2004A502C

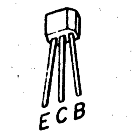
TR1----2SB772 (P,Q,R)
TR2,3---2SB605 (K,L,M)
TR4 to6, 12 to16
18,19,21,22
-----2SC536SP (E,F,G)
TR7,17---2SA608SP (E,F,G)
TR8-----2SA608K-NP (E,F,G)
TR9----2SA1069 (K,L)
TR10,11--2SC536K (E,F,G)
TR20---2SD571 (K,L,M)

LOCATION OF IC & TR

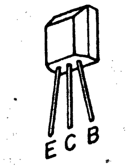
TR1	D1	TR15	C2
TR2	E1	TR16 to 18	C1
TR3	E1	TR19, 20	A1
TR4 to 7	E2	TR21	B2
TR8	D2	TR22	A1
TR9, 10	D1		
TR11	D2	IC1	E1
TR12, 13	A1	IC2	A,B2
TR14	B2		



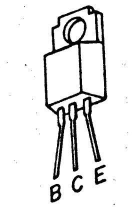
2SA608
2SC536



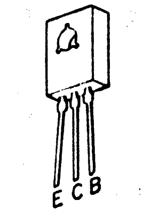
2SC536K



2SB605
2SD571

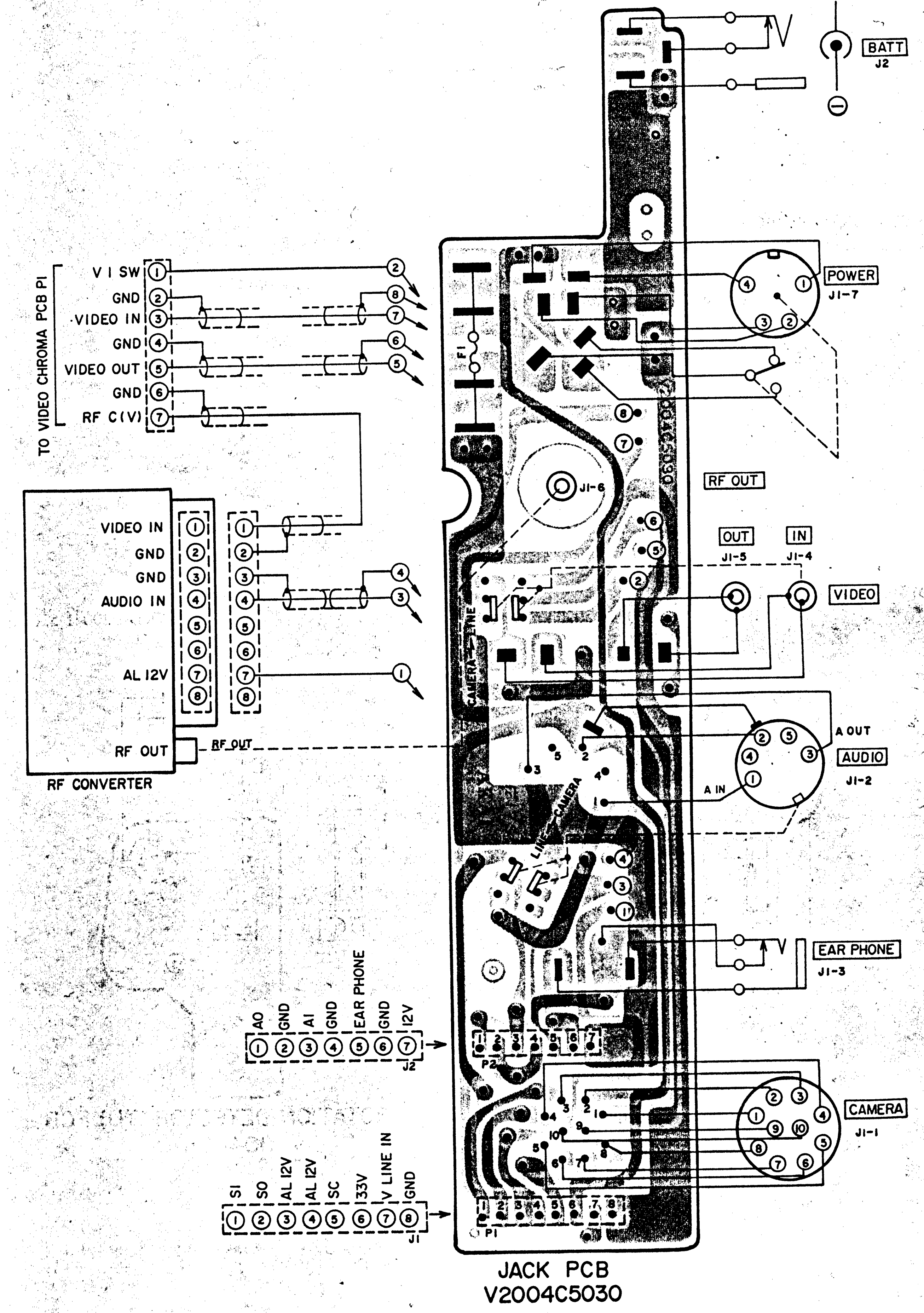


2SA1069

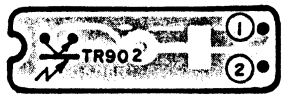


2SB772

7) JACK P.C BOARD V2004C5030

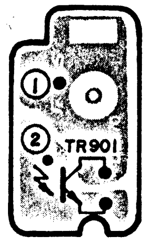

TO VIDEO CHROMA PCB P1
V I SW
GND
VIDEO IN
GND
VIDEO OUT
GND
RF C(V)
VIDEO IN
GND
GND
AUDIO IN
AL 12V
RF OUT
RF OUT
RF CONVERTER
AO
GND
A1
GND
EAR PHONE
GND
12V
J2
P2
SI
SO
AL 12V
AL 12V
SC
33V
V LINE IN
GND
J1
P1
BATT
J2
POWER
J1-7
RF OUT
OUT
J1-5
IN
J1-4
VIDEO
J1-6
F1
CAMERA
LINE
A OUT
AUDIO
J1-2
A IN
EAR PHONE
J1-3
CAMERA
J1-1
JACK PCB
V2004C5030

8) SENSOR (R) P.C BOARD V2004D5060



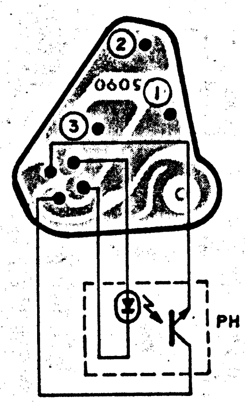
SENSOR(R) PCB
V2004D5060

9) SENSOR (L) P.C BOARD V2004D5070



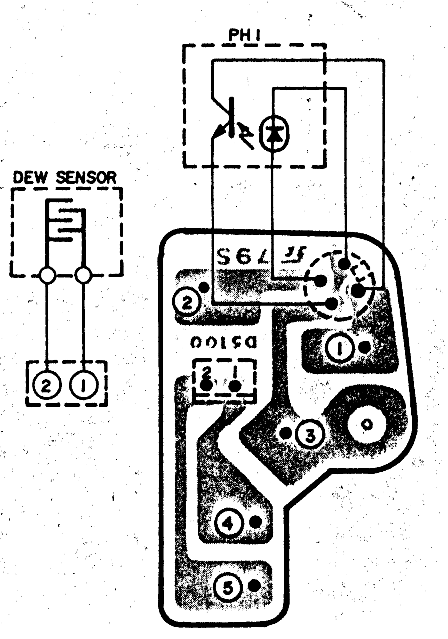
SENSOR (L) PCB
V2004D5070

10) ROTATION DETECTION (S)
P.C BOARD V2004D5090


②
5090
①
③
PH1

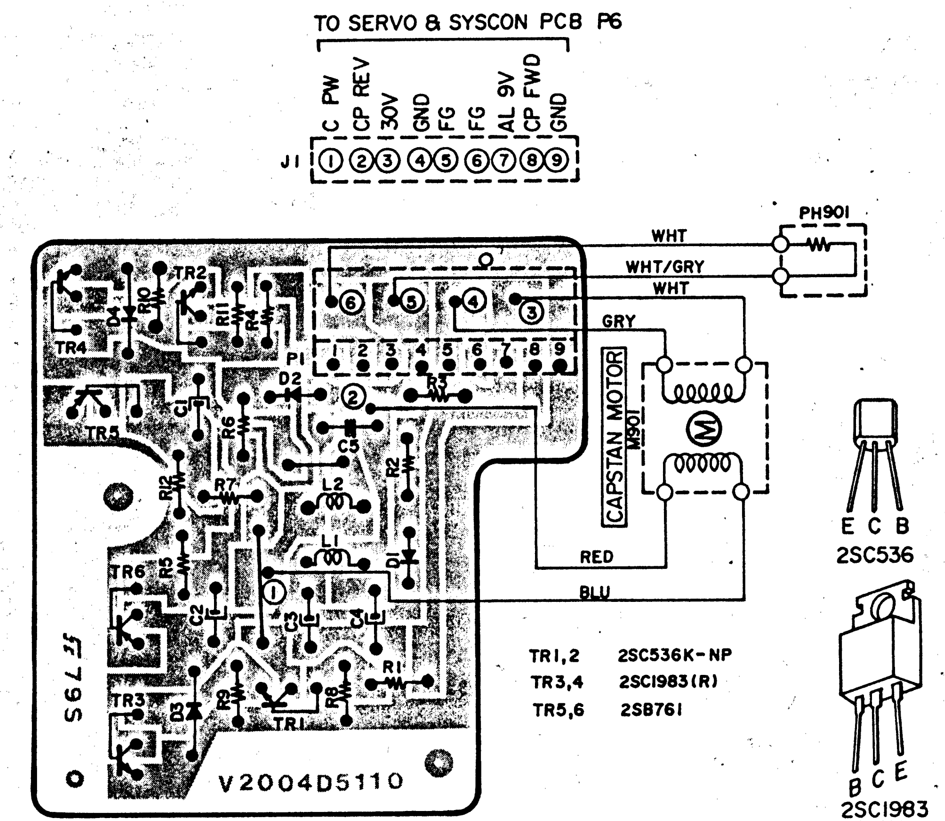
ROTATION DETECTOR(S) PCB
V2004D5090

11) ROTATION DETECTION (TU)
P.C BOARD V2004D5100


PH1
DEW SENSOR
②
①
795
D5100
②
①
③
④
⑤

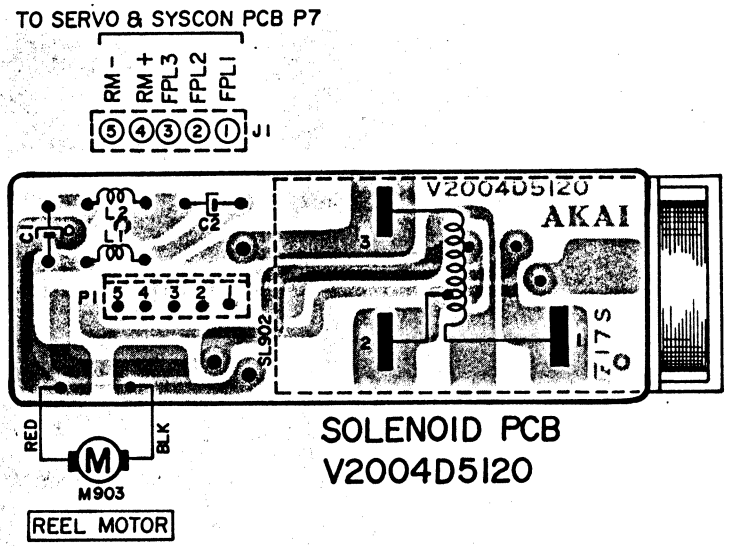
ROTATION DETECTOR (TU) PCB
V2004D5100

12) CAPSTAN MOTOR DRIVE P.C BOARD V2004D5110


TO SERVO & SYSCON PCB P6
C PW
CP REV
30V
GND
FG
FG
AL 9V
CP FWD
GND
J1
①②③④⑤⑥⑦⑧⑨
PH901
WHT
WHT/GRY
WHT
GRY
TR2
TR4
TR5
TR6
TR3
TR1
R10
R11
R4
D4
P1
1 2 3 4 5 6 7 8 9
⑥ ⑤ ④ ③
②
①
D2
R3
C1
R6
C5
R12
R7
L2
R2
L1
D1
R5
C2
C3
C4
R9
D3
R8
R1
795
V2004D5110
CAPSTAN MOTOR
M901
M
RED
BLU
TR1,2 2SC536K-NP
TR3,4 2SC1983(R)
TR5,6 2SB761
E C B
2SC536
B C E
2SC1983
2SB761

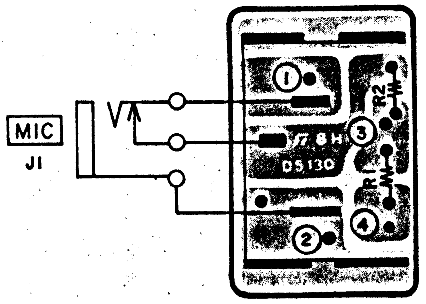
CAPSTAN MOTOR DRIVE PCB
V2004D5110

13) SOLENOID P.C BOARD V2004D5120


TO SERVO & SYSCON PCB P7
RM -
RM +
FPL3
FPL2
FPL1
⑤④③②①
J1
C1
L1
L2
C2
P1
5 4 3 2 1
SL902
V2004D5120
AKAI
795
RED
BLK
M
M903
REEL MOTOR

SOLENOID PCB
V2004D5120

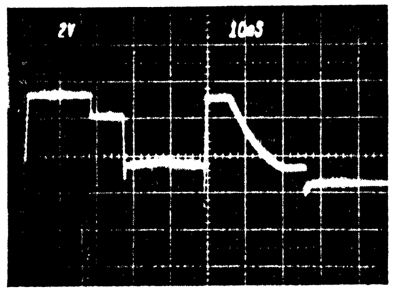
14) MIC JACK P.C BOARD V2004D5130


MIC
J1
①
②
③
④
TR2
D5130

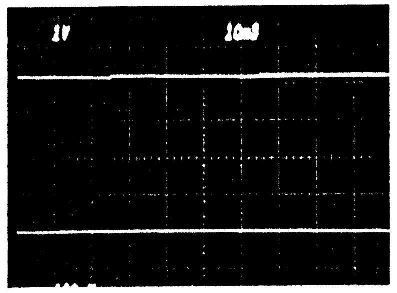
MIC JACK PCB
V2004D5130

1. SERVO/SYSCON P.C BOARD

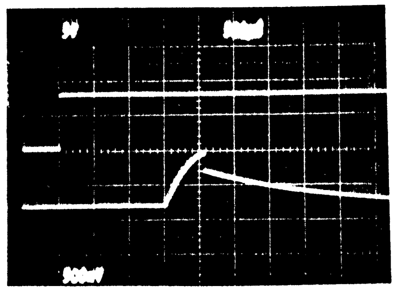
TP1 (PB)



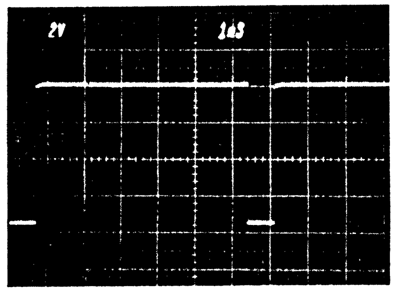
TP2 (PB)



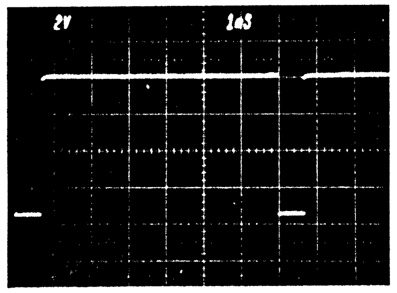
TP3, TP4 (PB)



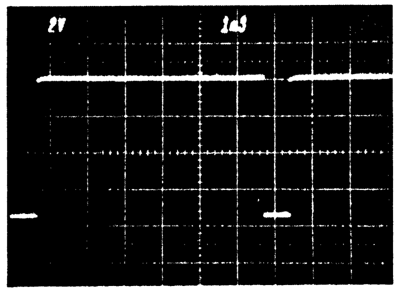
TP4 (CUE)



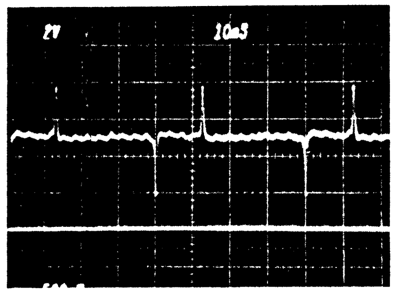
TP4 (REVIEW)



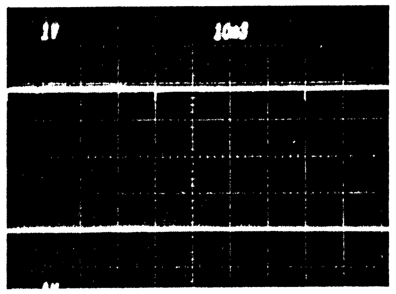
TP4 (REC CANCEL)



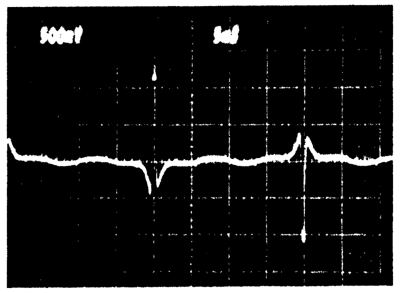
TP6 (PB)



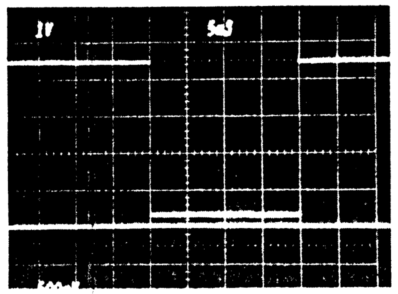
TP7 (PB)



TP8 (PB)

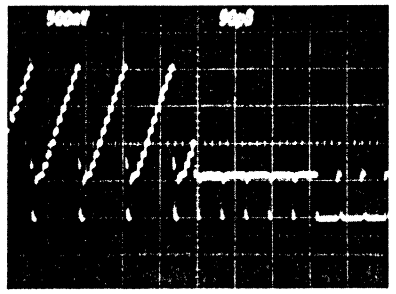


TP9 (PB)

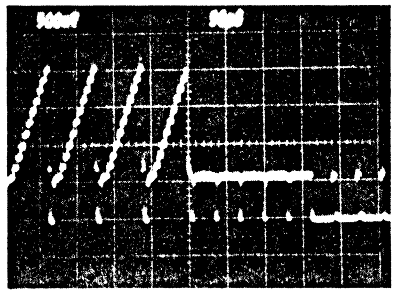


2. SWITCHING POINT

CH1 (VIDEO OUT, PB)

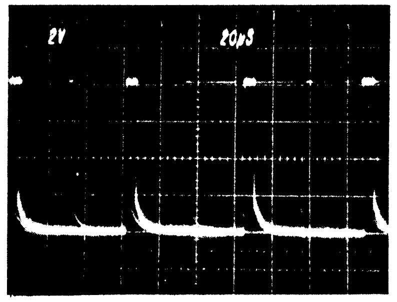


CH2 (VIDEO OUT, PB)



3. VIDEO Y P.C BOARD

TP1 (EE, REC)



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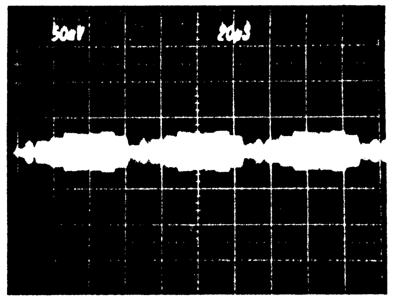

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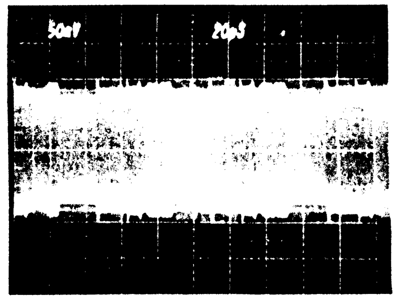

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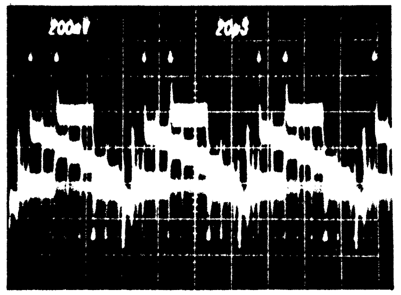

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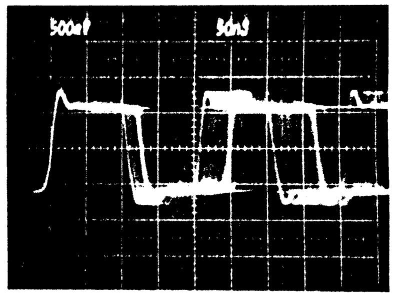

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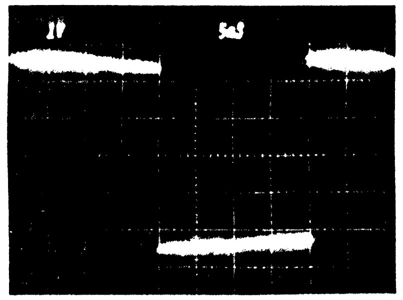

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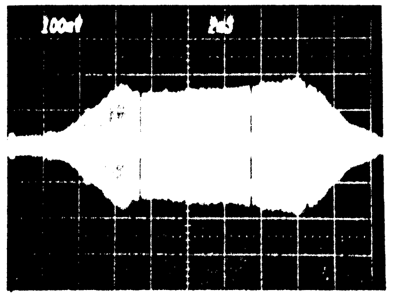

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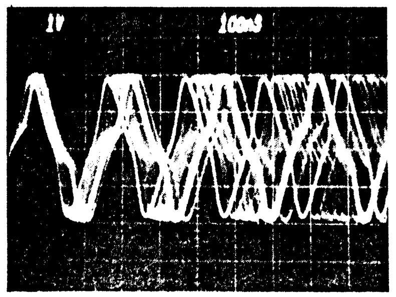

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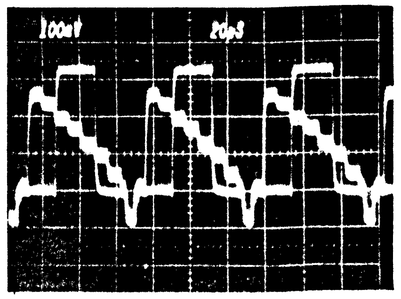
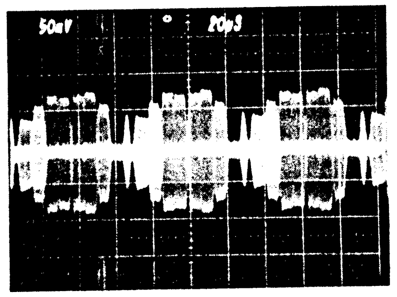


IC2 7 (PB)



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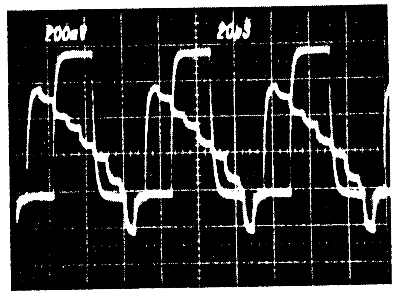

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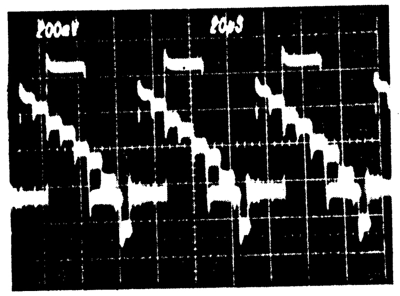

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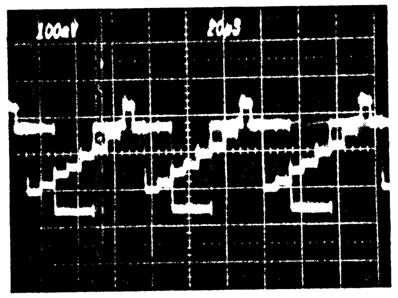
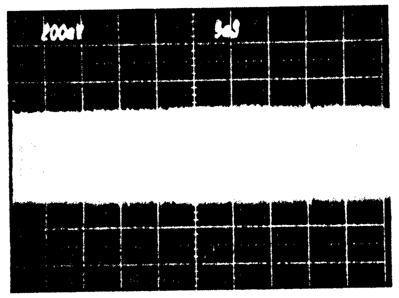


IC2 6 (PB)



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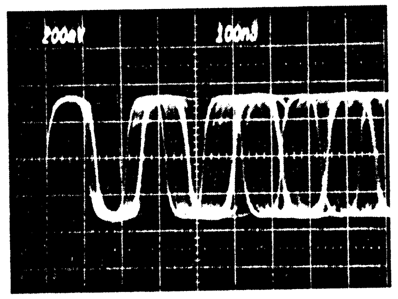
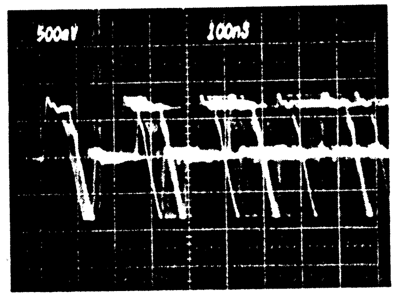


IC2 1 , 2 (PB)



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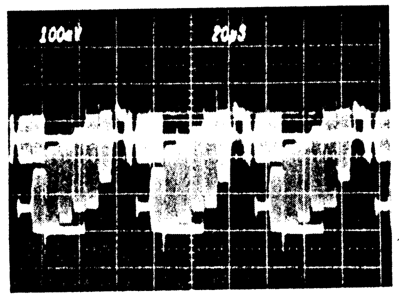
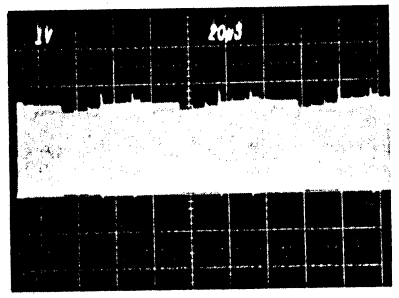


IC2 4 (PB)



4. VIDEO CHROMA P.C BOARD

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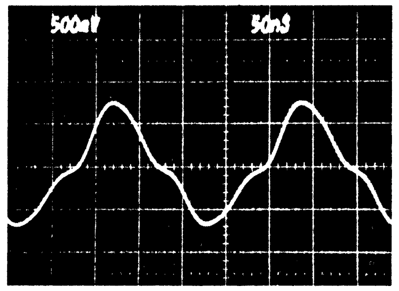

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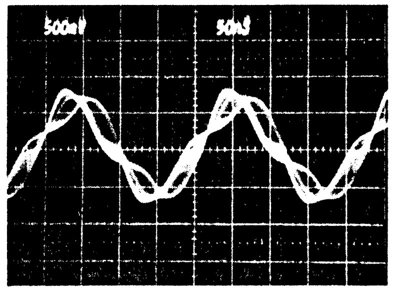
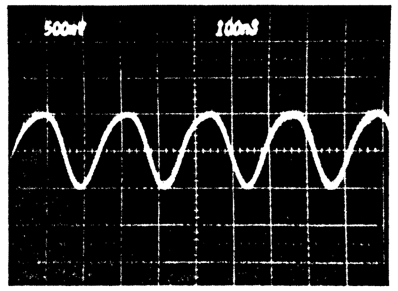
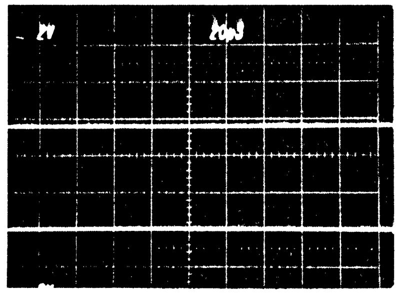


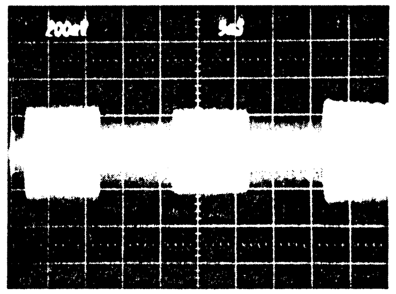
TP2 (EE, REC, PB)



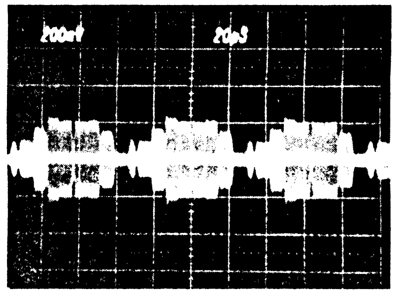
TP3 (REC)



TP5 (PB, V RATE)



TP5 (PB, H RATE)



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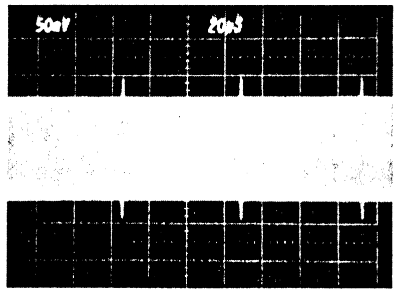

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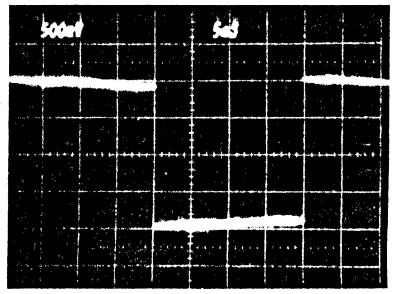
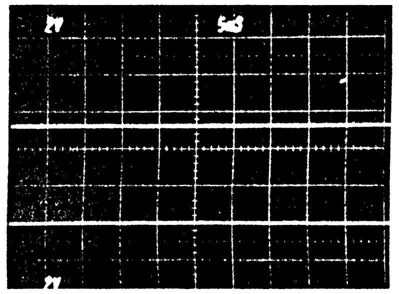
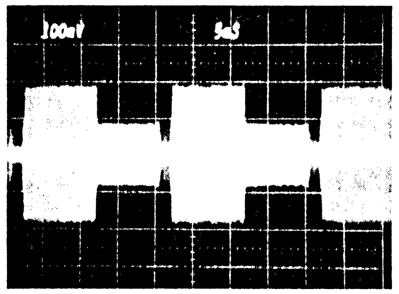


TP8 (REC, PB)



TP12 (PB, V RATE)



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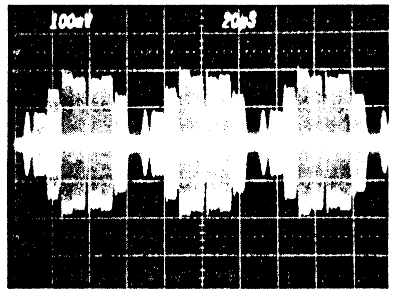
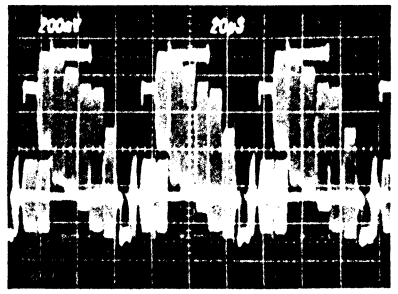


TP14 (EE, REC, PB)



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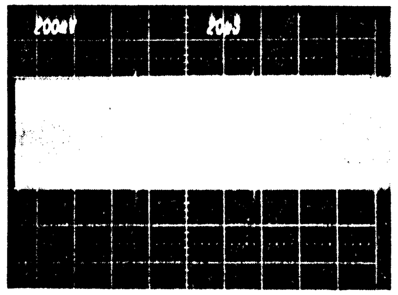

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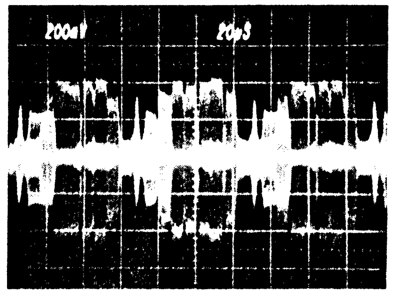

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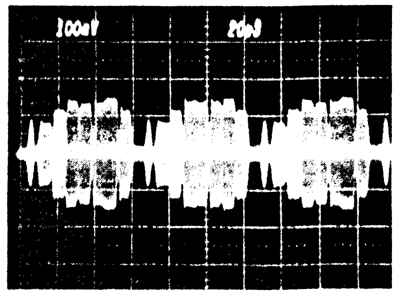
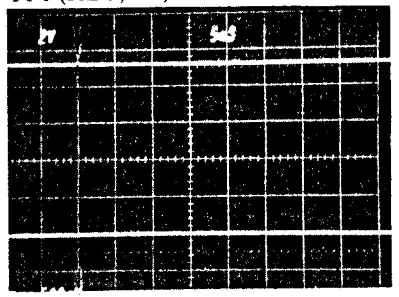


5. AUDIO/POWER P.C BOARD

TP1 (REC, PB)



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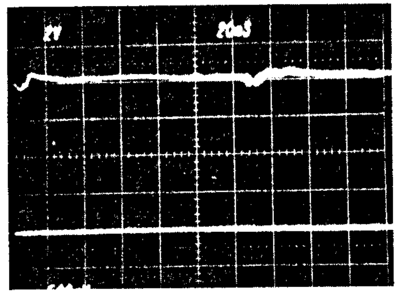
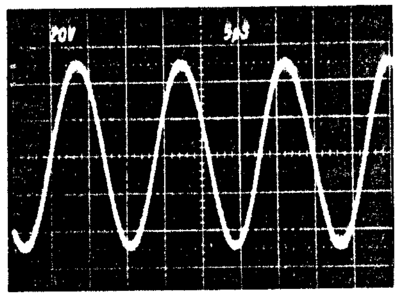
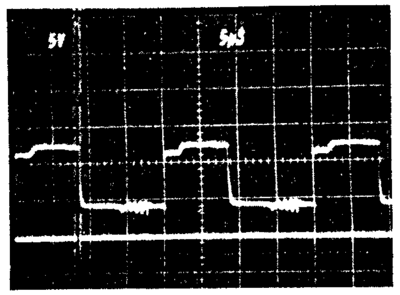


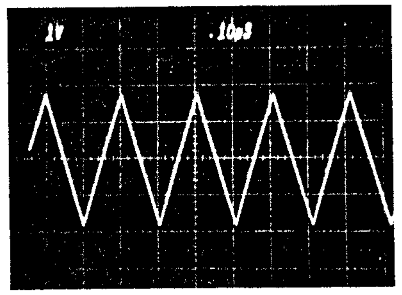
TP3 (REC)



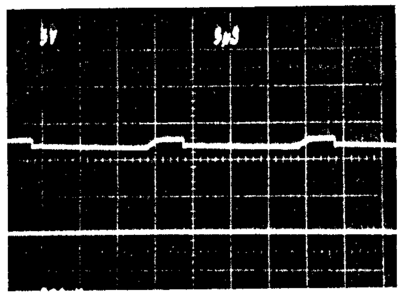
IC1 4 (PB)



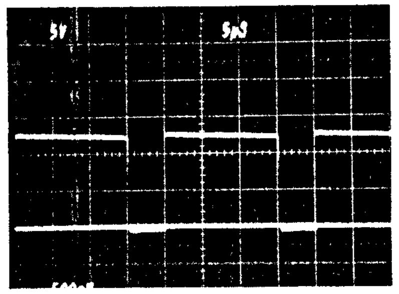
IC1 1 (EE, REC, PB)



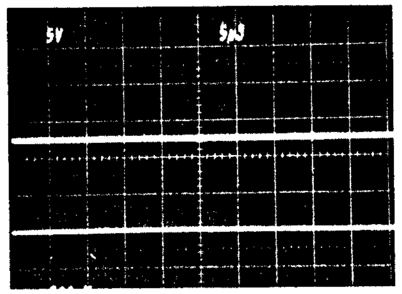
TR1 Base (EE)



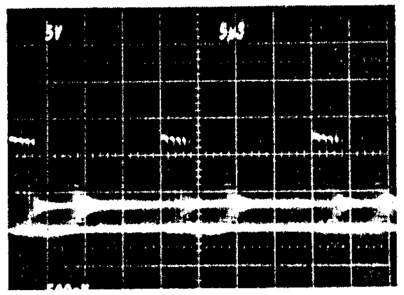
TR1 Collector (EE)



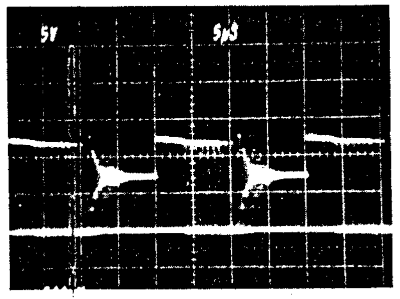
TR2 Collector (FF, RWD, CUE)



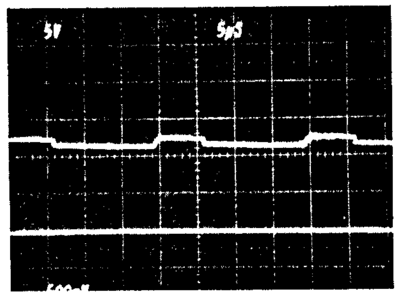
TR2 Collector (PB)



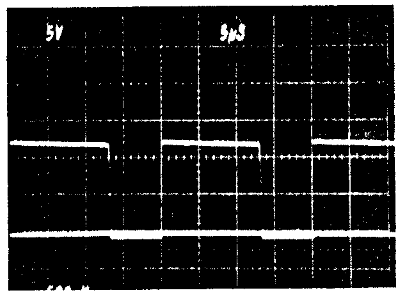
TR2 Collector (REVIEW)



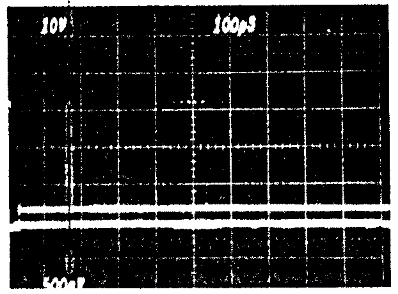
TR3 Base (PB)



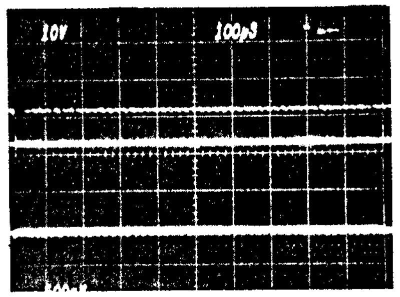
TR3 Collector (PB)

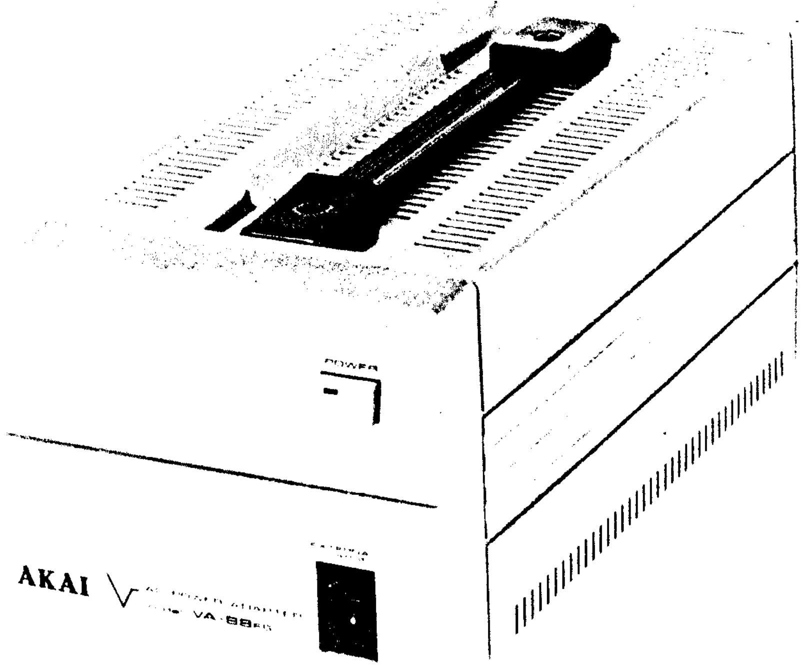


TR9 Collector (PB)



TR9 Collector (CUE, REVIEW)





SECTION 2

SERVICE MANUAL

AC Power Adapter
Model VA-88EG/EK

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I. SPECIFICATIONS

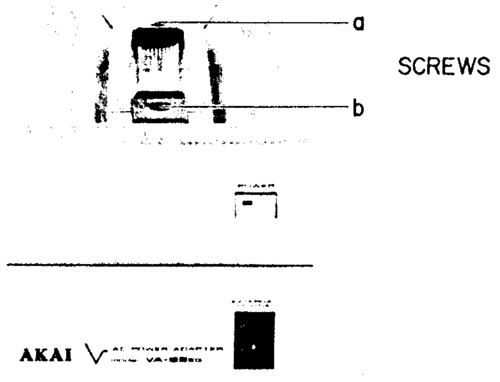
Power Requirement	110/220V (EG), 200/240V (EK), 50/60 Hz
Power Consumption	57 watts
Rated Output Voltage	12V DC
Rated Output Current	1.5A
Dimensions	130 (W), x 115 (H), 260 (D) mm
Weight	2.6 kg

* For improvement purposes, specifications and design are subject to change without notice.

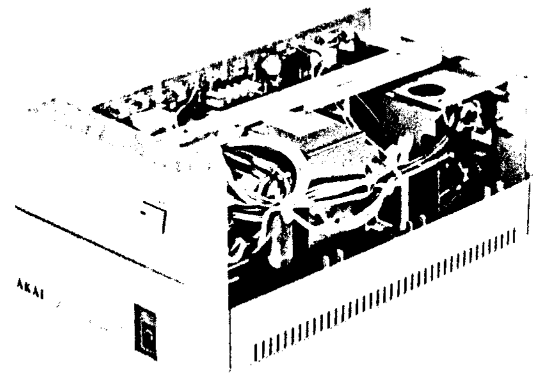
II. DISMANTLING OF UNIT

In case of trouble, etc. necessitating dismantling, please dismantle in the order shown in the photographs. Reassemble in reverse order.

1


a
b
SCREWS
AKAI

2



III. CONTROLS

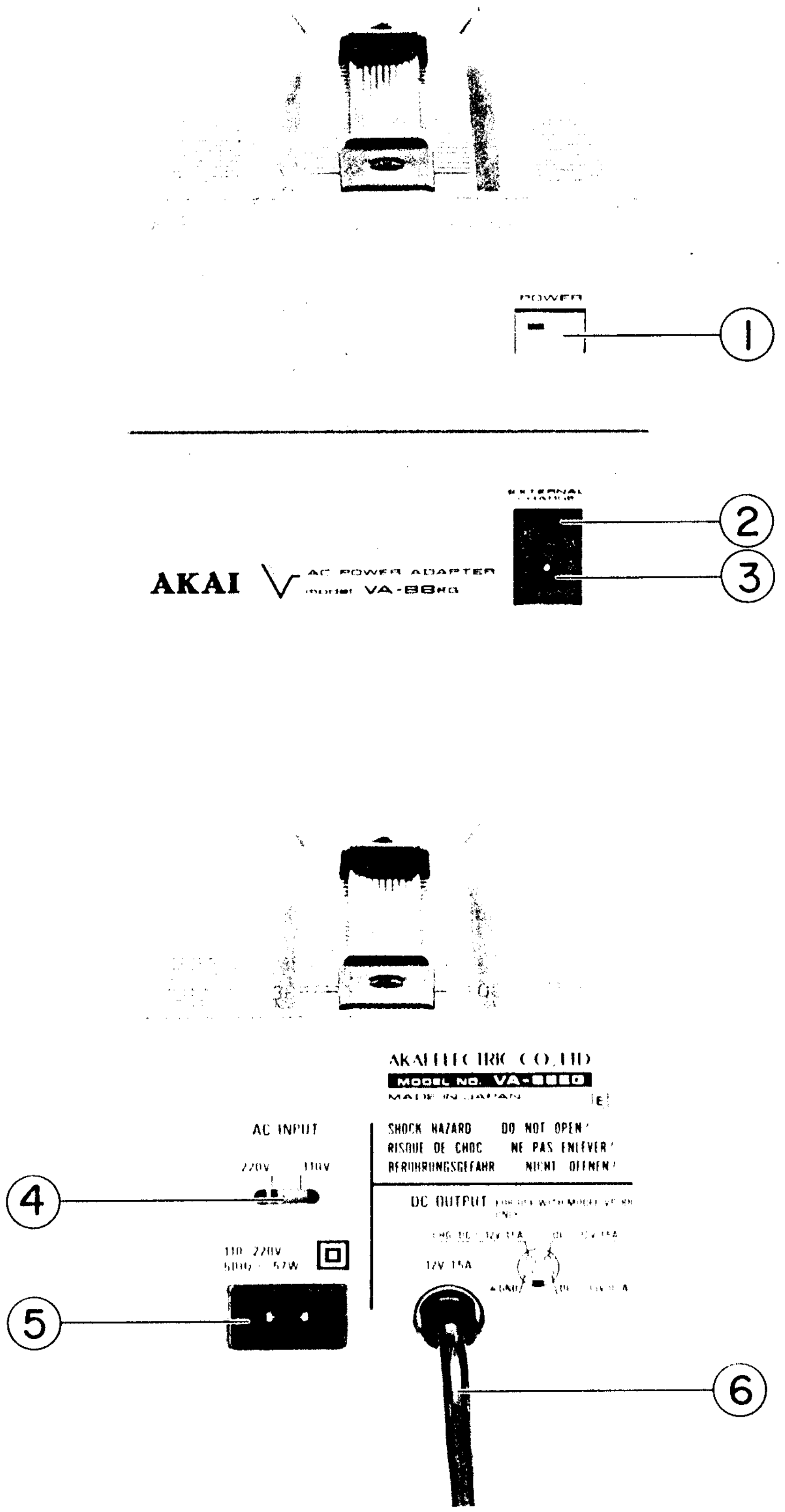

POWER
1
EXTERNAL CHARGE
2
3
AKAI
AC POWER ADAPTER
MODEL VA-88
AKAI ELECTRIC CO., LTD
MODEL NO. VA-88
MADE IN JAPAN
SHOCK HAZARD DO NOT OPEN
RISQUE DE CHOC NE PAS ENLEVER
BERUHRUNGSGEFAHR NICHT OFFNEN
AC INPUT
220V 110V
4
DC OUTPUT
12V 1.5A
5
6

Fig. 3-1

1. POWER SWITCH	4. AC INPUT SELECTOR
2. CHARGE INDICATOR	5. AC INLET
3. EXTERNAL CHARGE JACK	6. DC OUTPUT CABLE

IV. PRINCIPAL PARTS LOCATION

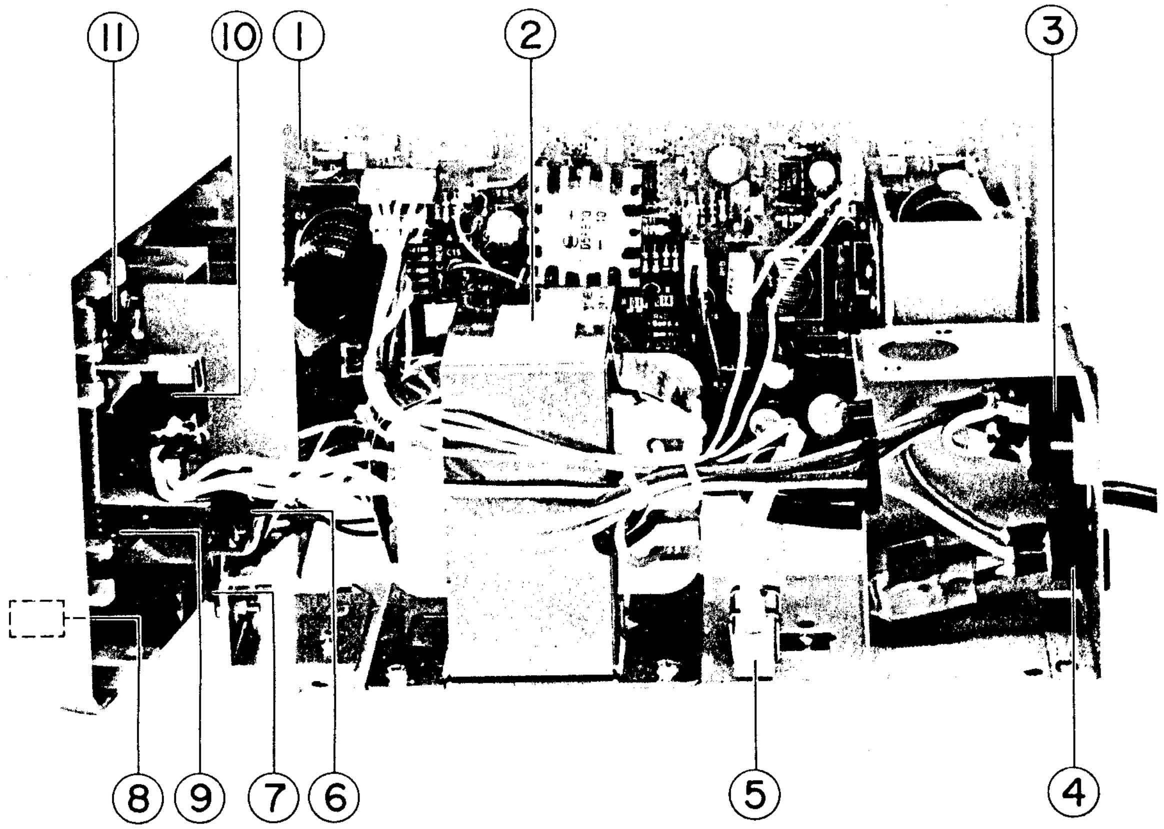

11
10
1
2
3
8
9
7
6
5
4

Fig. 4-1

1. POWER SUPPLY P.C BOARD
2. POWER TRANSFORMER
3. VOLTAGE SELECTOR SWITCH, SW901
4. AC INLET
5. SEMENT REGISTOR, R16
6. SCR, SR1
7. TR1
8. EXTERNAL CHARGE SOCKET
9. CHARGE INDICATOR, LED 1
10. POWER SWITCH SW902
11. POWER INDICATOR, LED2

V. VOLTAGE CONVERSION

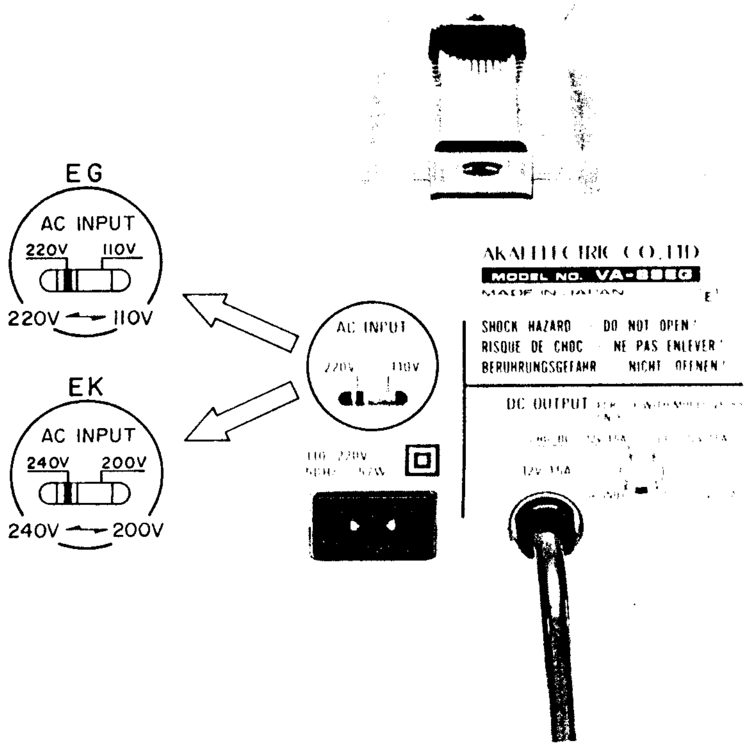

EG
AC INPUT
220V 110V
220V 110V
EK
AC INPUT
240V 200V
240V 200V
AC INPUT
AKAI ELECTRIC CO., LTD
MODEL NO. VA-88EG
MADE IN JAPAN
SHOCK HAZARD DO NOT OPEN
RISQUE DE CHOC NE PAS ENLEVER
BERUHRUNGSGEFAHR NICHT OFFNEN
DC OUTPUT

Fig. 5-1

Power requirements for electrical equipment differ from area to area. The operating voltage of VA-88 is preset to 220V (VA-88EG) or 240V (VA-88EK). Before connecting, check that the AC INPUT selector on the rear panel is set to the voltage for your area:
220V, 50 Hz for Europe except UK
240V, 50 Hz for UK
110V, 200V, 220V or 240V, 50 or 60 Hz for other countries. (If in doubt, consult a qualified electrician.)
If the AC INPUT is not set for your area:

1) Confirm that the POWER Switch on the rear panel is set to OFF.
2) Confirm that the POWER Cord is disconnected.
3) Move the AC INPUT selector with a screwdriver so that the marker is above the voltage for your area.

VI. DESCRIPTION OF CIRCUIT OPERATION

The power rectifying circuit for VA-88 is designed to handle three different power supply systems: 12V, 33V and CHARGE. Each power supply system has its own use. 12V DC supplied to VP-88 to operate the VTR section. 33V DC is supplied to the regulator section of VP-88 to drive the capstan motor. CHARGE is not steady DC but a pulse sequence and is used to charge the battery (BP-N88) for VP-88.

1. 12V DC CIRCUIT

The AC voltage output from the secondary side of the power transformer has noise removed by a line filter (L3), is rectified by D2, and smoothed by C8 before being applied to a constant-voltage circuit.

The constant-voltage circuit consists of TR3, TR4, IC1 and so forth. IC1 is for error amplification while TR3 and TR4 are current control transistors.

After being regulated there to 12V DC, the output is passed through R10 to the output terminal.

The protection circuit for this 12V DC circuit is made up of IC2 (2/2) and TR8.

Any abnormal current flowing through R-10 is detected by IC2 (2/2) which senses the voltage across it. The IC output is used to turn TR18 on/off via R66.

Thus, if an excessively large current is made to flow, the voltage at pin ⑥ of the IC2 (2/2) drops abnormally, causing the output at pin ⑦ to go to "H". This, in turn, activates TR8, causing IC1 ⑦ to go to "L" and IC1 ② to go to "H". As a result, the base of TR4 also goes to "H", which results in TR4 being cut off, causing the collector of TR4 to go to "L" and thus the base of TR3 to go to "L". As a result of all this, the output (12V DC) drops or is interrupted, thereby protecting both external and internal circuits.

This circuit is restored automatically as soon as the load on the 12V DC circuit is restored to the normal condition.

The IC2 (1/2) notifies the CHARGE circuit when VP-88 is in operation, so as to inhibit the charging operation. It serves as an automatic 12VDC/CHARGE switching circuit.

When VP-88 starts operating, the IC2 (1/2) detects a current flowing through R10 by sensing the voltage across it. IC output (1) goes to "H" and this "H" signal is supplied to the CHARGE circuit to stop the charging. In other words, the charging operation is inhibited as long as VP-88 is in operation.

2. 33V DC Circuit

The AC output from the secondary side of the power transformer is rectified by D1 and smoothed by C4. The output is then supplied to a constant-voltage circuit consisting of TR1, TR2, TR4, etc., where it is stabilized at a constant 33V DC.

This 33V DC serves as the power source for the capstan motor circuit on VP-88.

In the constant-voltage circuit, D4 (7V zener diode) keeps the emitter of TR2 (error amplifier) at a constant voltage level of 7V, and TR2 controls the current in TR1 (Darlington transistor for current control), thereby maintaining the output at a constant level of 33V DC.

Protection for the 33V DC circuit is made up of TR17, SR2, etc.

When the current in the 33V DC circuit increases abnormally, the voltage across R1 increases, which activates TR17. This in turn causes the gate voltage of SR2 to increase, establishing conduction between anode and cathode of SR2. As the result, the base of TR1 is shorted to GND, so it is cut off, which results in the 33V DC output being interrupted. This circuit is restored automatically when the load is restored to the normal condition.

3. CHARGE CIRCUIT

The AC output from the power transformer is rectified by D3 and then supplied to a current limiting circuit. Since the circuit does not have a smoothing capacitor, the voltage is not smoothed; that is, it retains the waveform which is the result of rectifying the AC voltage and consists of a pulsating current with maximum ripple.

Subsequently, the voltage is routed to SR1 via R16, where it is subjected to current control. Then, it is sent via D23 and RL1 to a connector from which the VP-88 battery can be charged.

The purpose of D-23 is to prevent reverse current at the time the battery is connected. Further, the charging of the EXT. BATTERY is done by switching RL1 with TR11.

If no battery is connected to the EXT-BATTERY terminal, the terminals (1) and (2) of the connector (P2) are shorted, and therefore the base of TR14 is supplied with 12V from the 12V line via D21. For this reason, TR14 is cut off and its collector voltage is at 0 volt, which means that the base of TR13 that follows is at "L", so TR13 conducts. The current flows through TR13, developing base bias for TR12, so TR12 is also activated, causing the TR12 collector voltage to go to "L". TR11 is cut off because of absence of bias. RL1 therefore is not energized, and the charging voltage is routed for use internally. Then, when a partly-charged battery is connected to the EXT-BATTERY terminal, pins ① and ② of the connector (P2) are separated and (1) is connected to the (+) terminal of the battery, and pin (2) is opened. The anode of D22 which is connected to pin (1) of IC2(1/2), and pin (1) of IC2 1/2 is low when DC 12V is unused thus the base of TR14 goes low, and TR14 turns on.

The current in TR14 flows through R47, at which time a differentiated signal is delivered to R45 via C18. As the voltage acorss R45 increases, the base voltage of TR13 also increases, causing TR13 to be cut off. In addition, TR12 is also cut off, which increases the collector voltage of TR12. This in turn causes TR11 to conduct, and energize RL1. As a result, the charging voltage is linked to EXT-BATTERY and thus charging is started.

When C18 is fully charged, the voltage across R45 is reduced. This in turn lowers the base voltage of TR13, causing TR13 to be turned on. TR12 is then turned on and TR11 turned off, thereby making it impossible to continue the charging of the external battery.

In order to continue the charging operation, it is necessary to keep RL1 energized. Therefore, bias is supplied from the 12V line via R36 and D18 to the base of TR13 to hold TR13 in the OFF state, until the charging of the external battery is complete. In addition, bias is also supplied to TR11 via R36 and D12 to hold TR11 in the ON state.

All this ensures that when the power is turned on, priority is given to an external battery through the actin of D12 and D18. Thus, with the power turned on, RL1 functions so that the external battery is charged by the charging circuit. However, if an external battery is not connected or is fully charged, switching to the internal battery is made immediately .

Conversely, if the external battery is not fully charged, charging of the external battery takes place and then when the charging is complete, switching is made to the internal battery.

If RL1 is on the INT side (e.g., during charging of the internal battery), connecting an external battery causes TR14 to be activated, thereby a charging C18. The RL1 is switched to EXT, at which time TR14 acts as a trigger.

4. CHARGE INDICATOR CIRCUIT

The charge (CHG) LED indicates that the charging is in progress.

When the charging current is flowing, the voltage across R16 increases, turns on TR5 and is routed to R25 via D28. It is then smoothed into DC through a ripple filter (R26, R27, R28, C13 and C14). (Note that the voltage that activates TR5 contains a lot of ripples since it is not smoothed at the output of D3.)

This DC voltage activates TR8. The TR8 current flows through R70 and the CHG LED, lighting the LED to indicate that charging is in progress.

CHARGE STOP CIRCUIT

When the charging of the battery is complete, the charging operation is stopped as follows:

As charging proceeds, the voltage across the battery increases while the charging current is reduced. This reduction in charging current causes the voltage across R16 to be reduced, resulting in TR5 being turned off. In addition, TR8 is also turned off, the CHG LED is deactivated, and TR9 is activated via R31 and R32.

When TR9 is turned on, the base bias of TR10 is lowered through D13, D14 and D15, which in turn deactivates TR10. With TR10 turned off, the base bias of TR6 is increased and the collector voltage of TR6 is reduced. Then, a drop in the gate voltage of SR1 causes SR1 to be cut off. As a result, the battery charging current causes to flow.

6. 12V DC/CHARGE SWITCHING CIRCUIT

When VP-88 starts operating, the voltage across R10 increases and pin (1) of IC2 (1/2) goes to "H". This "H" signal activates TR7 via R23. Therefore, the collector voltage of TR7 goes to "L". As a result, the gate voltage of SR1 drops, SR1 stops conducting and the charging operation ceases.

The "H" output from pin (1) of IC-2 (1/2) is applied to the junction of C16 and R37 via R35 and D16. This is not for the purpose of activating TR10 (TR10 cannot be turned on because R35 has a high resistance value of 220 kohms), but to set the junction of C16 and R37 to "H".

Thus, by increasing the voltage at that point while VP-88 is in use, C16 is kept in a discharged condition with this voltage being nearly 12V.

When VP-88 is stopped, ① of IC-2 (1/2) goes to "L", causing a charging current to flow through C16. This current activates TR10. Therefore the base voltage of TR6 drops and its collector voltage increases, which causes the gate voltage of SR1 to increase, which switches SR1 into a conductive state so that the battery charging current flows.

In this manner, the charging of C16 triggers off the charging of the battery.

7. CHARGE-INHIBIT CIRCUITRY

VA-88 incorporates 3 protection circuits in its charging circuit.

1) Protection against excessive load current.
2) Protection where the charging terminal is connected to a resistor or other electronic device instead of a battery.
3) Protection where the charging current is not reduced even after charging to employed or where the battery terminal voltage fails to increase.

7-1. Protection Circuit against Excessive Load Current

When the charging current has become excessive, the charging operation is stopped to protect the battery and internal circuitry.

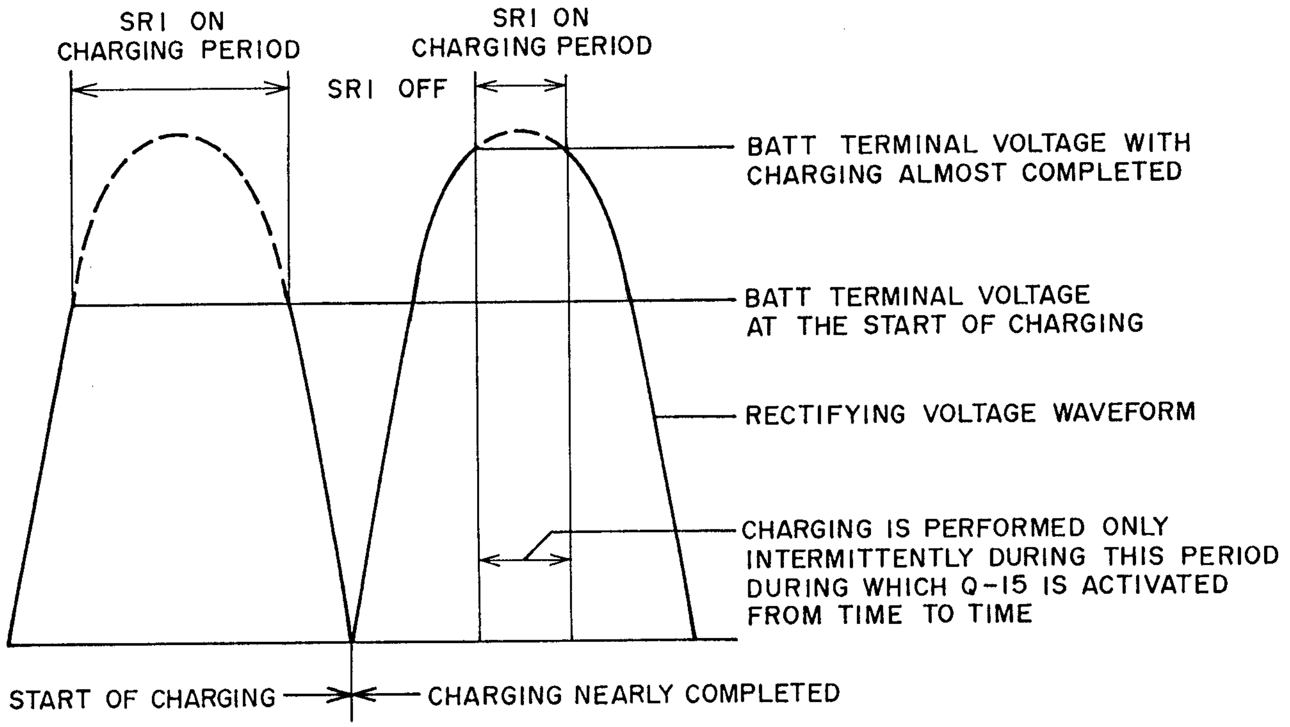
The excessive charging current causes the voltage across R16 to increase excessively. This voltage activates TR19 and allows current to flow through TR19, and D33 and is then integrated by C26. If the voltage across the C26 is abnormally high, then the base bias of TR7 is increased, which activates the TR7, thereby stopping the charging operation by switching off SR1.

7-2. Protection Circuit (for use where a device other than a battery is connected)

If instead of the battery, a resistor or other electronic device is connected to the BATTERY terminal, the cathode side of D23 is not supplied with the DC voltage from the battery.

Thus, the pulsating current containing ripples on the anode side of D23 is delivered directly to the cathode side of D23. This ripple current is conveyed to C25 via C24 and D31. The voltage made available then activates TR16. This also activates TR7, thereby stopping the charging operation.

7-3. Additional CHARGE-Inhibit Circuit


SR1 ON
CHARGING PERIOD
SR1 ON
CHARGING PERIOD
SR1 OFF
BATT TERMINAL VOLTAGE WITH CHARGING ALMOST COMPLETED
BATT TERMINAL VOLTAGE AT THE START OF CHARGING
RECTIFYING VOLTAGE WAVEFORM
CHARGING IS PERFORMED ONLY INTERMITTENTLY DURING THIS PERIOD DURING WHICH Q-15 IS ACTIVATED FROM TIME TO TIME
START OF CHARGING
CHARGING NEARLY COMPLETED

If the voltage at the charging terminal fails to increase and the charging current keeps flowing even after the charging is completed, there is the possibility that the battery will be overheated.

To protect the battery and internal circuitry in these circumstances, it is therefore necessary to provide a circuit that stops the charging operation. This circuit is made up of TR15 and IC3, and operates as follows:

As shown in the figure below, the BATT terminal voltage is low at the start of the charging operation and the portion that exceeds the BATT terminal voltage (dotted portion on the waveform shown at left) represents the charging period. When the charging is nearing completion, the BATT terminal voltage increases and the charging period is shortened (as shown by the waveform at right).

Finally, the charging is performed intermittently over the peak of the waveform.

TR15 has its base connected to the gate of SR1 and its emitter connected to the anode of the SR1. Thus, during the charging period, the anode of SR1 and the emitter of TR15 have their voltage levels lowered to the BATTERY voltage. Outside the charging period, SR1 is switched OFF, and therefore the rectifying voltage is applied.

As the charging operation proceeds, the emitter-base voltage of TR15 varies in steps with the varying anode voltage of SR1, and thus the base-emitter voltage of TR15 remains at an almost constant value, resulting in TR15 being cut off.

When the charging is nearly completed, the charge operation is performed only intermittently during the peaks of the rectifying waveform. At this stage, SR1 does not conduct even at "peak" time, and therefore the charging current flow ceases intermittently. Under this condition, the voltage at the anode of SR1 and emitter of TR15 does not drop to the level of the BATTERY voltage.

As a result, TR15 is activated for a short period of time during which the charging current does not flow even at "peak" time, which makes a pulse current flow through D25 to charge C20.

The voltage developed across C20 is applied to pins ② and ③ of IC3, thereby cancelling the RESET state of IC3.

Upon cancellation of the RESET state, a timer starts operating which uses an oscillator and count-down circuit within IC3. After a time lapse of 15 minutes which is determined by the combined time constants of C21, C22 and R56, pin ⑥ is set to "L", which in turn causes TR10 to be cut off through the action of D26 and D13 TR13, thereby stopping the charging operation.

In this manner, the charging operation is not allowed to continue for more than 15 minutes after the battery is almost fully charged. This helps to prevent excessive charging and overheating of the battery and VA-88 itself, thereby resulting in reduced power consumption.

VII. ADJUSTMENT

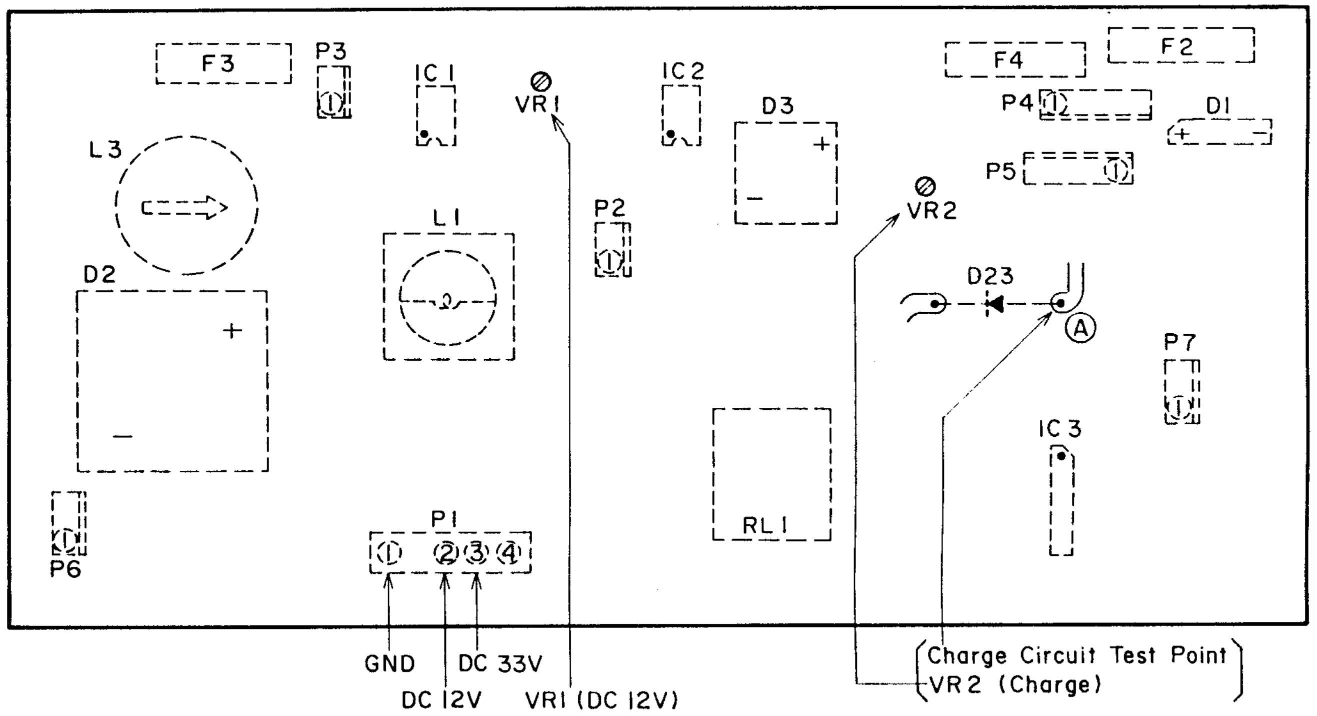
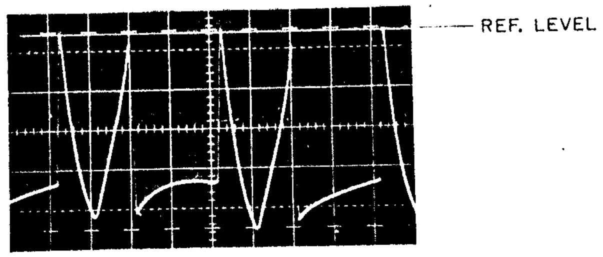

F3
P3
IC1
VR1
IC2
D3
F4
F2
P4
D1
L3
P5
VR2
L1
P2
D2
D23
Ⓐ
P7
IC3
RL1
P1
① ②③④
P6
GND
DC 33V
DC 12V
VR1 (DC 12V)
Charge Circuit Test Point
VR2 (Charge)

Fig. 7-1

DC Output Voltage Adjustment

Step	Adjustment Item	Test Point	Mode (VP-88)	Adjustment Parts	Result
1	DC 12V	P1 2 (GND: P1 ①)	PLAY	VR1	+12.8V ±0.2V
2	DC 33V	P1 3 (GND: P1 ①)	PLAY CUE or PLAY REVIEW	Confirm	+30 to 35V

2. CHARGE SETTING LEVEL ADJUSTMENT



This adjustment is required only when TR6 (2SC1815), D9 to D11 (1S2076), R18 (18K) or R19 (27K) is replaced in the charging circuit.
Otherwise, do not tamper with VR2.

2-1. Measuring Apparatus

1) An oscilloscope
2) A power supply with output voltage of 17V or so: should be microadjustable
3) A digital voltmeter
4) A thermometer
5) VP-88

2-1. Method of Adjustment

1) Remove the casing of VA-88 and turn on the power and then allow it to stand as is for 1 hour.
2) Measure the temperature around the temperature detecting diodes (D9 to D11) with a thermometer and calculate the adjustment level from the temperature gradient for the setting level given below:

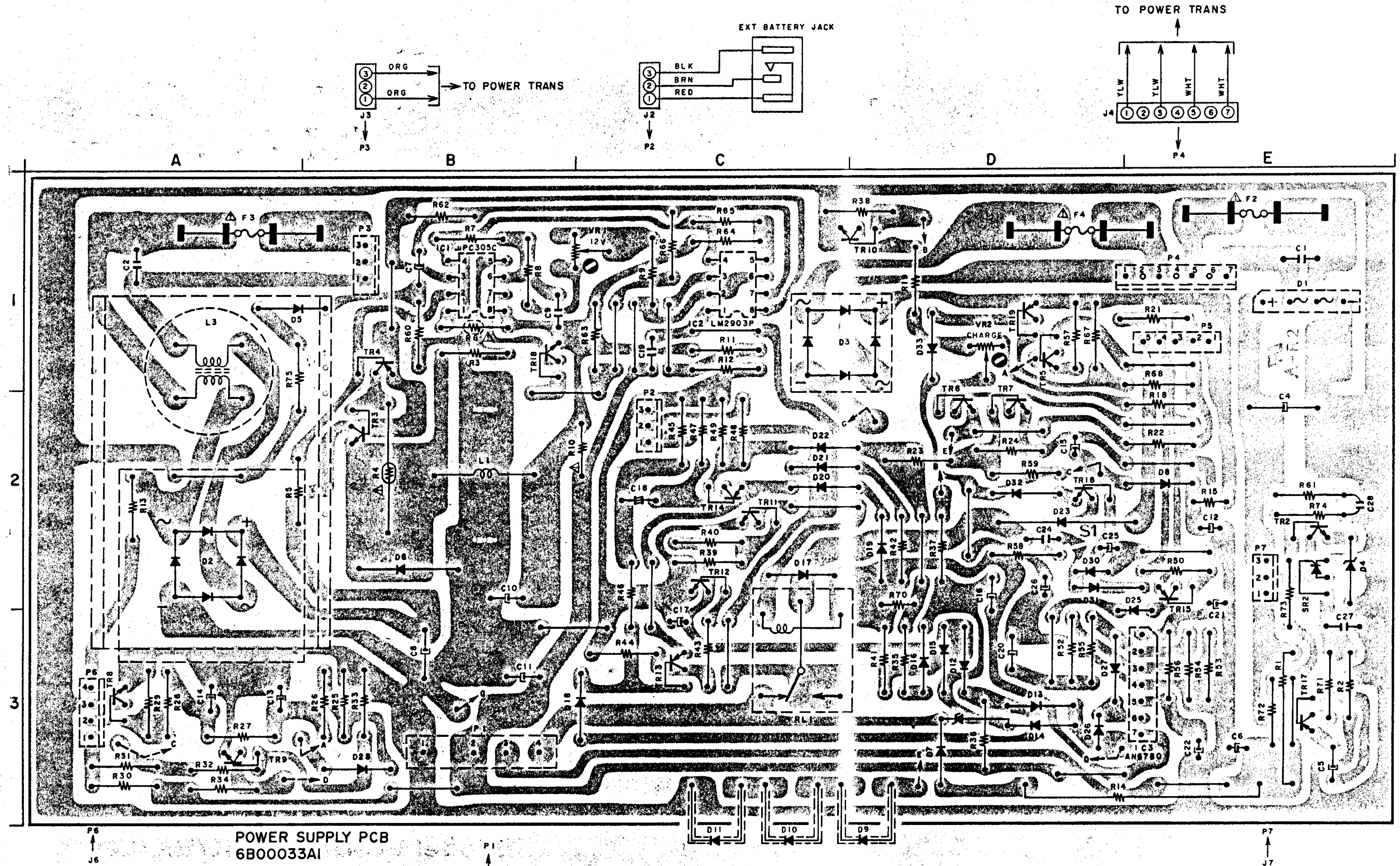
Temperature gradient for setting level : $16.3 - 0.044T$

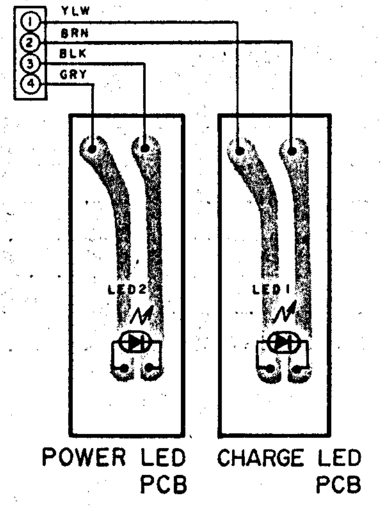
Where T is the temperature around the temperature detecting diodes

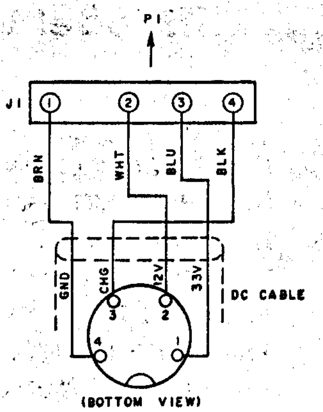
3) Adjust the power supply output to the voltage as determined in 2. above. (Be sure to use a digital voltmeter.)
4) Connect an oscilloscope to the output terminal of the power source and make setting to the desired graduation on the oscilloscope.
5) Connect VP-88 and then connect the brobe of the oscilloscope (the one used in 4. above) to point Ⓐ in Fig.7-1.
6) Adjust VR2 (2.2K) so that the peak of the waveform is on the graduation selected in 4. when switching is made from Power ON to OFF on the VP-88.

VIII. COMPOSITION OF VARIOUS P.C BOARDS

POWER SUPPLY P.C BOARD 6B00033A1, POWER LED P.C BOARD AND CHARGE LED P.C BOARD


TO POWER TRANS
EXT BATTERY JACK
TO POWER TRANS
ORG
ORG
J3
P3
BLK
BRN
RED
J2
P2
YLW
YLW
WHT
WHT
J4
P4
A
B
C
D
E
1
2
3
F3
F4
F2
IC1 μPC305C
IC2 LM2903P
IC3 AN6780
VR1 12V
VR2 CHARGE
L1
L3
D1
D2
D3
RL1
S1
TR1
P6
P7
POWER SUPPLY PCB
6B00033A1
D11
D10
D9
P6
P1
P7


J6
YLW
BRN
BLK
GRY
LED2
LED1
POWER LED
PCB
CHARGE LED
PCB


J1
BRN
WHT
BLU
BLK
GND
CHG
12V
33V
DC CABLE
(BOTTOM VIEW)

TR1 ----------2SD635
TR2,6 to 12, 16,18 ---2SC1815 (O,Y)
TR3 --------2SC2373(K,L)
TR4,5,13 to 15 17,19 --2SA1115 (D,E)

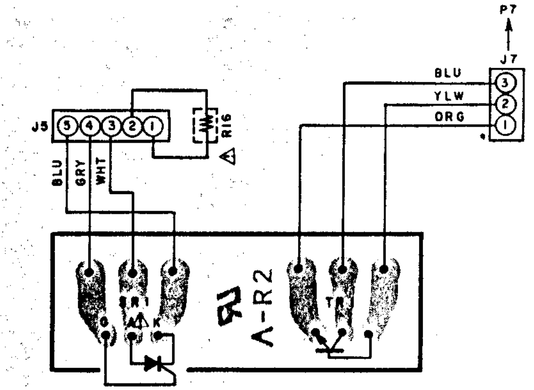
SR1---CR3CM-1
SR2---CR02AM-2

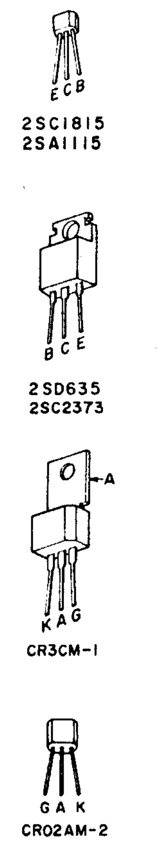
LOCATION OF IC & TR

IC1.........B1
IC2.........C1
IC3.........E3

TR2.........E2
TR3.........B2
TR4.........B1
TR5.........D1
TR6.........D2
TR7.........D2
TR8.........A3
TR9.........A3
TR10........D1
TR11........C2
TR12........C2
TR13........C3
TR14........C2
TR15........E2
TR16........D2
TR17........E3
TR18........B1
TR19........D1

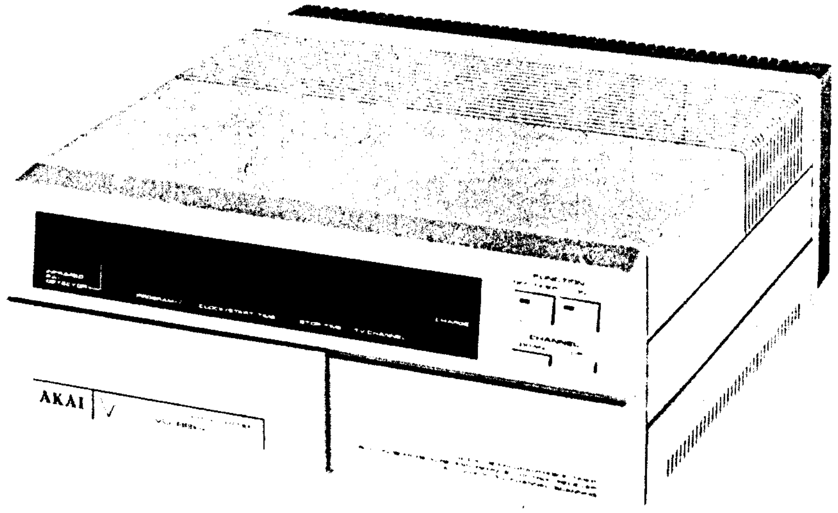
SR2.........E2


J5
BLU
GRY
WHT
R16
A-R2
J7
BLU
YLW
ORG


ECB
2SC1815
2SA1115
BCE
2SD635
2SC2373
A
KAG
CR3CM-1
GAK
CR02AM-2

WARNING ⚠ INDICATES SAFETY CRITICAL COMPONENTS. FOR CONTINUED SAFETY REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER'S RECOMMENDED PARTS.

AVERTISSEMENT ⚠ IL INDIQUE LES COMPOSANTS CRITIQUES DE SECURITE POUR MAINTENIR LE DEGRE DE SECURITE DE L'APPAREIL NE REMPLACER QUE DES PIECES RECOMMANDEES PAR LE FABRICANT



SECTION 3

SERVICE MANUAL

Colour TV Tuner Adapter
Model VU-88EG/EK/EA/EO

TABLE OF CONTENTS

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VII. COMPOSITION OF VARIOUS P.C BOARDS 144

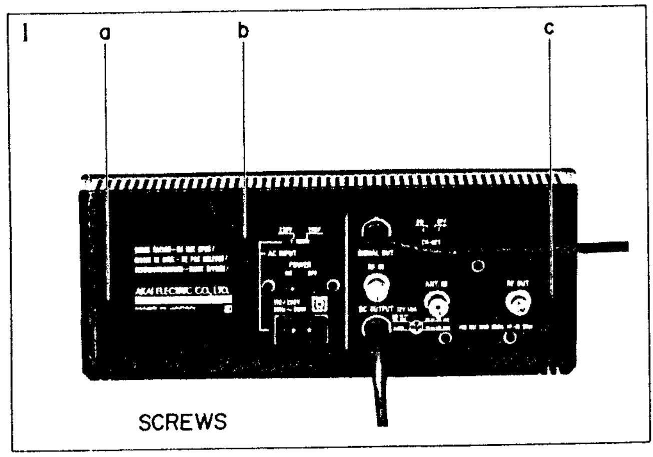
I. SPECIFICATIONS

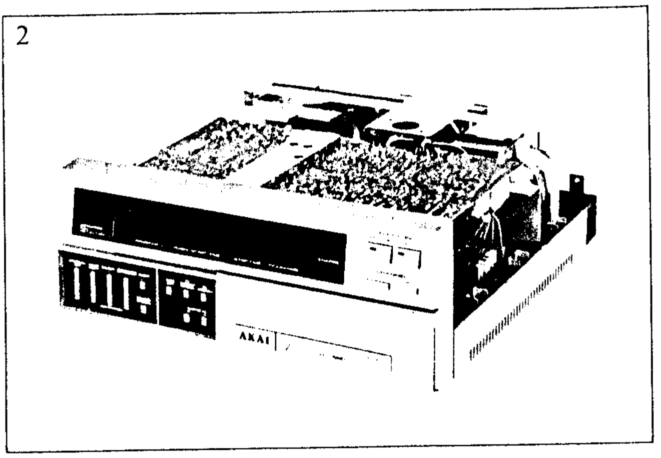
GENERAL	
Power Requirement	110/200/220/240, 50/60 Hz
Power Consumption	80 Watts
Weight	4.5 kg
Dimensions	275 (W) x 115 (H) x 290 (D) mm
Temperature Operating	0°C to 40°C
TUNER SECTION	
Aerial Input VU-88EG	VHF Band I, channels 2 to 4 VHF Band III, channels 5 to 21 UHF Band IV/V,channels 21 to 69
VU-88EK	UHF Band IV/V, channels 21 to 69 only
Aerial Output VU-88EG/EK	UHF channels 30 to 39 (adjustable) Set to channel 36 prior to shipment.
Video Output	1.0 Vp-p, 75 ohms
Audio Output	120 mV (PAL), 90 mV (SECAM)
TIMER SECTION	
Clock Display	24 hour fluorescent digital display
Clock Reference	Locked to power line frequency, 50/60 Hz self select
Number of Programs	9 programs possible: five 14 days one time memory programs two every day programs two every week programs Sleep operation possible
AC POWER ADAPTER/CHARGER SECTION	
Rated Output Voltage	12V DC
Rated Output Current	1.5A (Adapter mode)
Battery Pack to be charged	Exclusive Ni-Cd battery pack, BP-N88

* For improvement purposes, specifications and design are subject to change without notice.

II. DISMANTLING OF UNIT

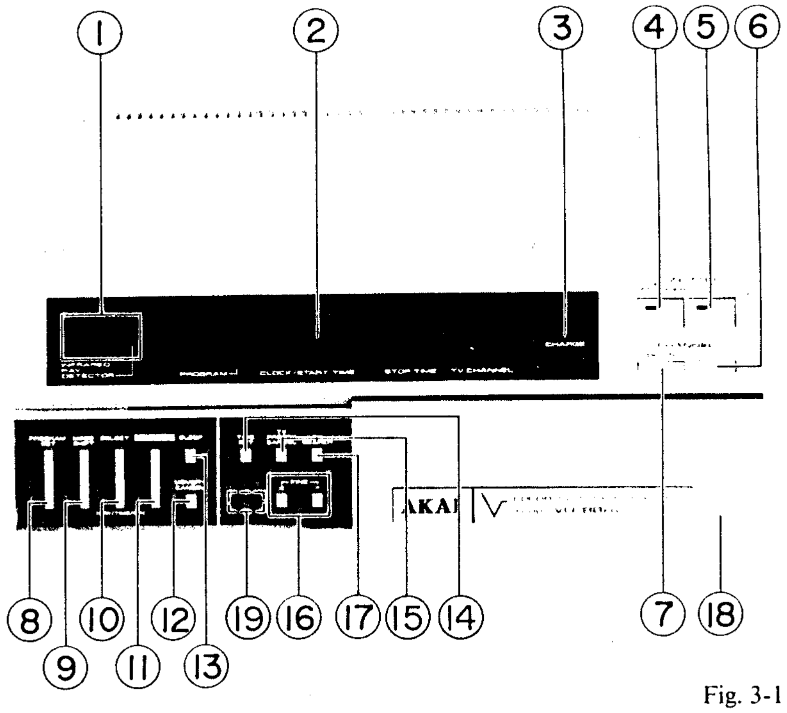
In case of trouble, etc. necessitating dismantling, please dismantle in the order shown in the photographs. Reassemble in reverse order.


1
a
b
c
SCREWS



III. CONTROLS

1. VU-88 EG/EK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⑤
⑥
⑧
⑩
⑫
⑲
⑯
⑰
⑮
⑭
⑦
⑱
⑨
⑪
⑬
AKAI

Fig. 3-1

1. INFRARED RAY DETECTOR and REMOTE CONTROL INDICATOR
2. DIGITAL DISPLAY (PROGRAM, CLOCK/START TIME, STOP TIME, TV CHANNEL)
3. CHARGE INDICATOR
4. FUNCTION OFF/TIMER BUTTON
5. FUNCTION ON BUTTON
6. CHANNEL UP BUTTON
7. CHANNEL DOWN BUTTON
8. PROGRAM SET BUTTON
9. MODE SHIFT BUTTON
10. SELECT BUTTON (DAY/TIME/CHANNEL)
11. MEMORIZE BUTTON
12. MEMORY CANCELL BUTTON
13. SLEEP BUTTON
14. TIME SET BUTTON
15. TV PRESET CANCEL BUTTON
16. FINE TUNING BUTTONS
17. TV SEARCH BUTTON
18. FUNCTION BOARD COVER
19. VIDEO/TV SELECTOR (EA MODEL ONLY)

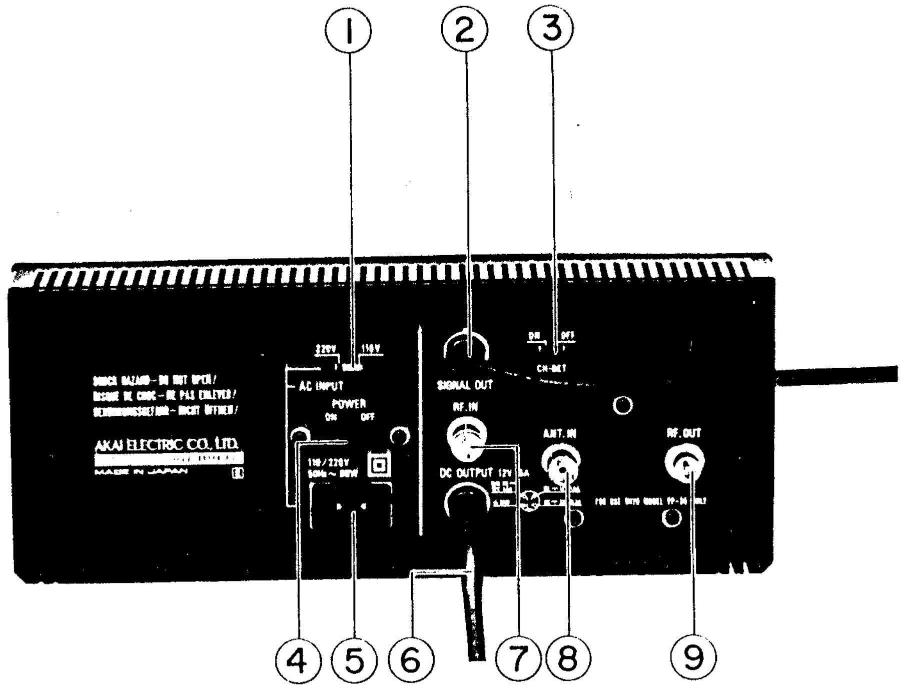

①
②
③
④
⑤
⑥
⑦
⑧
⑨
AKAI ELECTRIC CO., LTD.
SIGNAL OUT
RF IN
ANT. IN
RF OUT
DC OUTPUT
AC INPUT
POWER
CH-SET

Fig. 3-2

1. AC INPUT SELECTOR
2. SIGNAL OUT CABLE
3. CHANNEL SET SWITCH
4. POWER SWITCH
5. AC INLET
6. DC OUTPUT CABLE
7. RF IN CONNECTOR (from VP-88)
8. ANTENNA (ANT.) IN CONNECTOR
9. RF OUT CONNECTOR

2. RC-V88

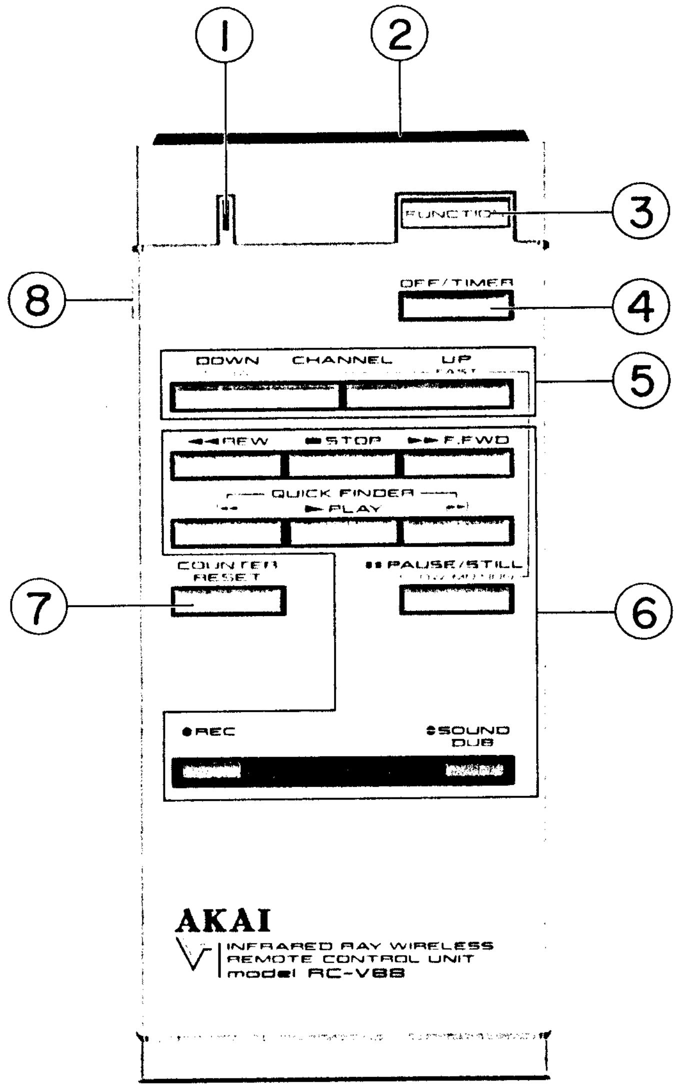

1
2
3
4
5
6
7
8
FUNCTION
OFF/TIMER
DOWN CHANNEL UP
FAST
◄◄REW
■STOP
►►F.FWD
QUICK FINDER
◄◄
►PLAY
►►
COUNTER RESET
▮▮PAUSE/STILL
●REC
●SOUND DUB
AKAI
INFRARED RAY WIRELESS
REMOTE CONTROL UNIT
model RC-V88

Fig. 3-3

1. REMOTE CONTROL INDICATOR
2. TRANSMITTING WINDOW
3. FUNCTION BUTTON
4. OFF/TIMER BUTTON
5. CHANNEL/SLOW, FAST (SLOW MOTION) BUTTONS
6. OPERATING BUTTONS
7. COUNTER RESET BUTTON
8. SAFETY LOCK

IV. PRINCIPAL PARTS LOCATION

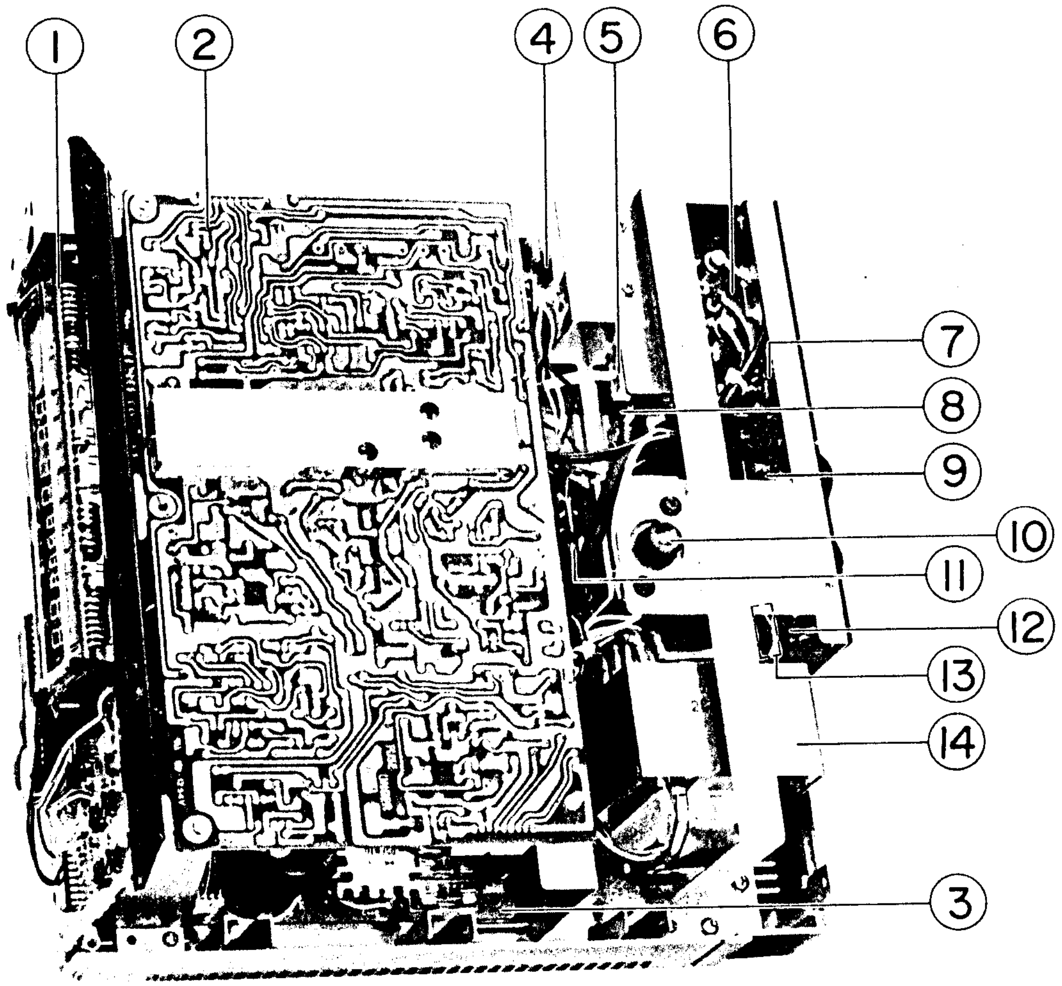

1
2
3
4
5
6
7
8
9
10
11
12
13
14

Fig. 4-1

1. DISPLAY P.C BOARD
2. TUNER P.C BOARD
3. POWER P.C BOARD
4. TR403
5. SEMENT RESISTOR, R493
6. BOOSTER
7. CHANNEL SET SWITCH, SW903
8. TR404
9. RF INPUT
10. FUSE HOLDER, F901 (ONLY FOR EK-MODEL)
11. SCR. SR401
12. VOLTAGE SELECTOR, SW902
13. POWER SWITCH, SW901
14. POWER TRANSFORMER, T901

V. VOLTAGE CONVERSION

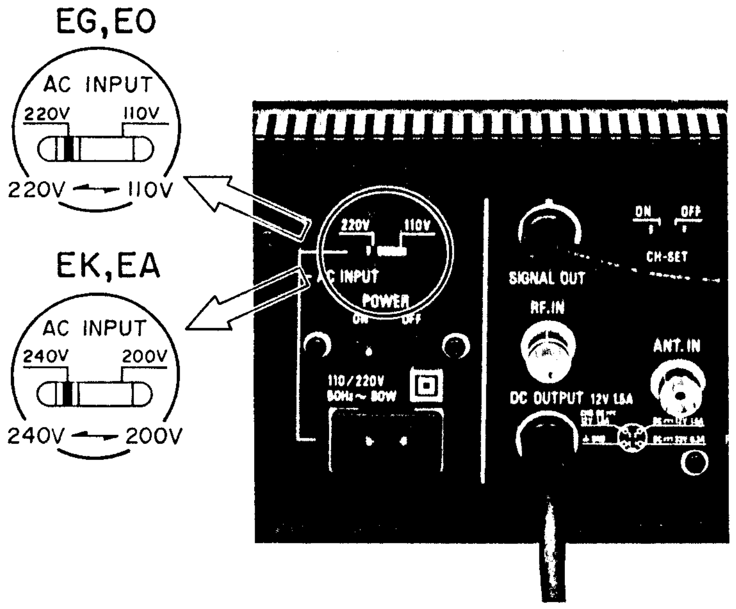

EG,EO
AC INPUT
220V
110V
220V ⟷ 110V
EK,EA
AC INPUT
240V
200V
240V ⟷ 200V
220V
110V
AC INPUT
POWER
ON
OFF
110/220V
50Hz~ 80W
SIGNAL OUT
RF.IN
ANT.IN
DC OUTPUT 12V 1.5A
CH-SET
ON
OFF

Fig. 5-1

Power requirements for electrical equipment differ from area to area. The operating voltage of VU-88 is preset to 220V (VU-88EG) or 240V (VU-88EK). Before connecting, check that the AC INPUT selector on the rear panel is set to the voltage for your area:

220V, 50 Hz for Europe except UK
240V, 50 Hz for UK
110V, 200V, 220V or 240V, 50 or 60 Hz for other countries. (If in doubt, consult a qualified electrician.)

If the AC INPUT is not set for your area:

1) Confirm that the POWER Switch on the rear panel is set to OFF.
2) Confirm that the POWER Cord is disconnected.
3) Move the AC INPUT selector with a screwdriver so that the marker is above the voltage for your area.

VI. ADJUSTMENT

1. POWER SUPPLY ADJUSTMENT AND CONFIRMATION

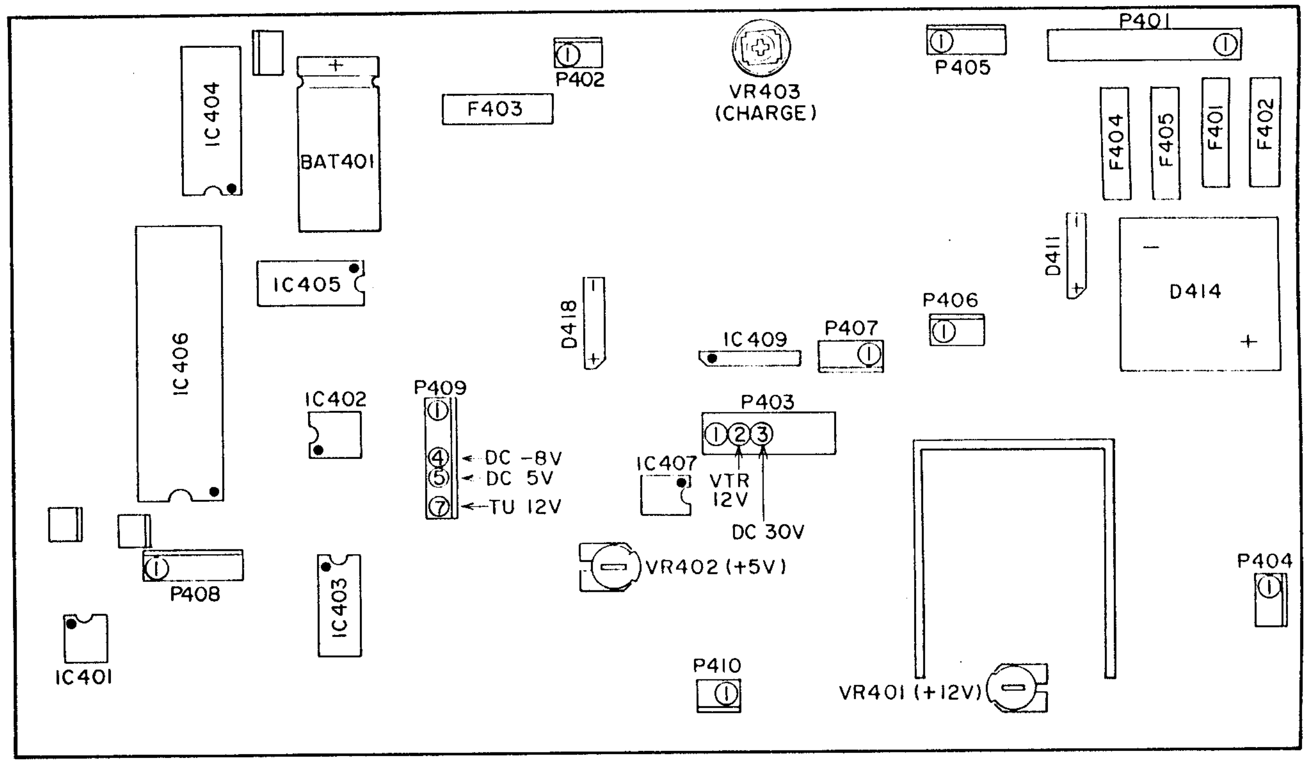

IC404
BAT401
F403
P402
VR403 (CHARGE)
P405
P401
F404
F405
F401
F402
D411
D414
IC405
IC406
D418
IC409
P407
P406
IC402
P409
P403
DC -8V
DC 5V
TU 12V
IC407
VTR 12V
DC 30V
VR402 (+5V)
P408
IC403
P404
IC401
P410
VR401 (+12V)

Fig. 6-1 Power P. C Board (Parts Side)

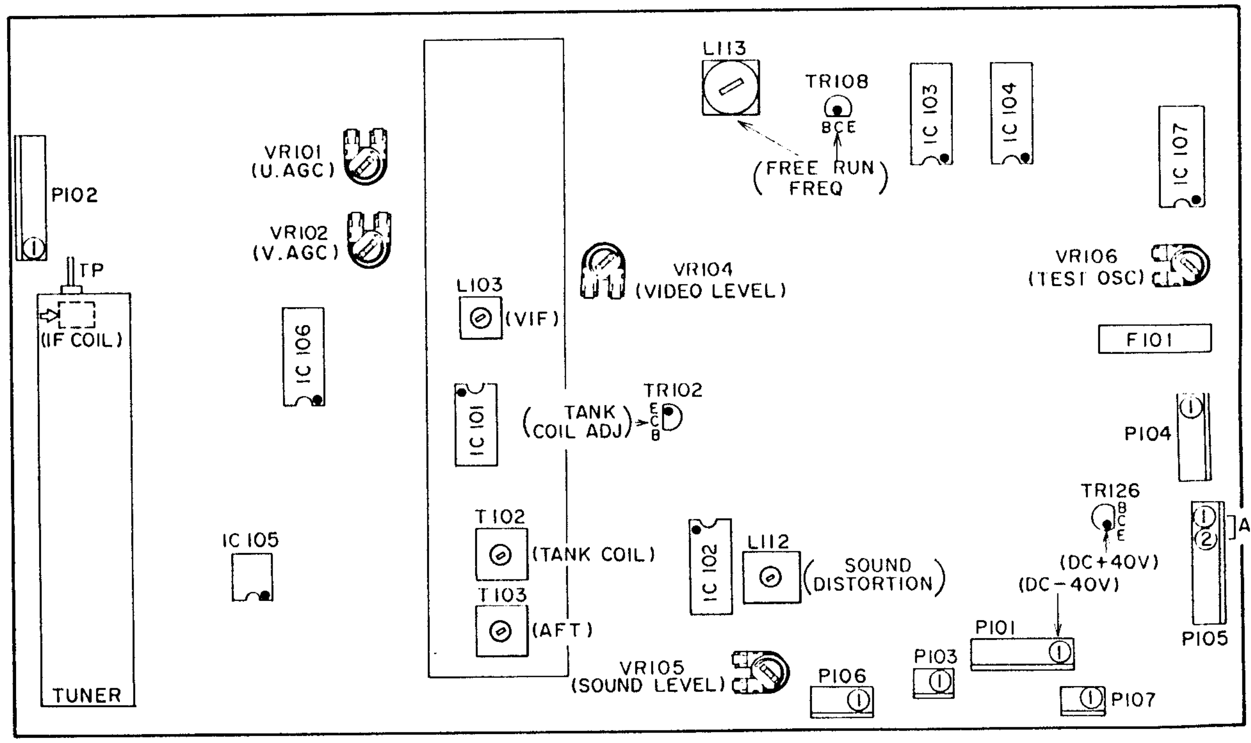

P102
TP
(IF COIL)
TUNER
VR101 (U.AGC)
VR102 (V.AGC)
IC106
IC105
L113
TR108
BCE
(FREE RUN FREQ)
IC103
IC104
IC107
L103
(VIF)
VR104 (VIDEO LEVEL)
VR106 (TEST OSC)
F101
IC101
(TANK COIL ADJ)
TR102
P104
TR126
AC 5V
T102
(TANK COIL)
T103
(AFT)
IC102
L112
(SOUND DISTORTION)
(DC+40V)
(DC-40V)
P101
P105
VR105 (SOUND LEVEL)
P106
P103
P107

Fig. 6-2 Tuner P. C Board (Parts Side)

2. CHARGE SETTING LEVEL ADJUSTMENT

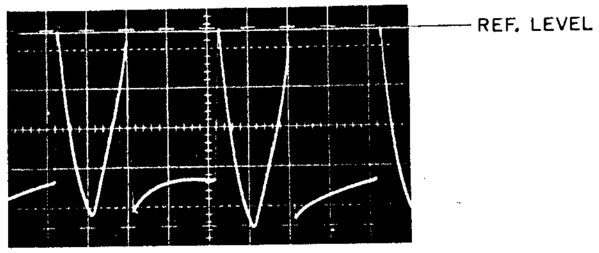


Fig. 6-3

This adjustment is required only when TR426 (2SC1815), D429 to D431 (1S2076), R463 (18K) or R461 (27K) is replaced in the charging circuit. Otherwise, do not tamper with VR2.

2-1. Measuring Apparatus

1) An oscilloscope
2) A power supply with output voltage of 17V or so: should be micro-adjustable
3) A digital voltmeter
4) A thermometer
5) VP-88

2-2. Method of Adjustment

1) Remove the casing of VA-88 and turn on the power and then allow it to stand as is for 1 hour.
2) Measure the temperature around the temperature detecting diodes (D429 to D431) with a thermometer and calculate the adjustment level from the temperature gradient for the setting level given below:

Temperature gradient for setting level : 16.3 – 0.044T

Where T is the temperature around the temperature detecting diodes.

3) Adjust the power supply output to the voltage as determined in 2) above. (Be sure to use a digital voltmeter.)
4) Connect an oscilloscope to the output terminal of the power source and make setting to the desired graduation on the oscilloscope.
5) Connect VP-88 and then connect the probe of the oscilloscope (the one used in 4) above) to Connector (405 Pin ① in Power PCB.
6) Adjust VR2 (2.2K) so that the peak of the waveform is on the graduation selected in 4. when switching is made from Power ON to OFF on the VP-88 (Fig. 6-3).

Step	Adjustment Item	Test Point	Adjustment Parts	Result	Remarks
1	VTR 12V	P403 ⑵ (Power PCB)	VR301	DC +12.5V ±0.25V	Less than 15 mVp-p
2	DC 5V	P409 ⑤ (Power PCB)	VR402	DC +5V ±0.1V	'Less than 15 mVp-p
3	TU 12V	P409 ⑦ (Power PCB)	Confirm	DC +11.9V ±0.25V	Less than 15 mVp-p
4	DC 8V	P409 ⑷ (Power PCB)	Confirm	DC −8V ± 1V	Less than 15 mVp-p
5	DC 30V	P409 ⑶ (Power PCB)	Confirm	DC +30V to 35V	Less than 3 mVp-p
6	DC +40V	TR126 Emitter (Tuner PCB)	Confirm	DC +40V ±4V	Less than 0.2 Vp-p
7	DC −40V	P101 ① (Tuner PCB)	Confirm	DC −39V ±4V	Less than 0.2 Vp-p
8	AC 5V	P105 ⑴–⑵ (Tuner PCB)	Confirm	AC 4.8 to 5.4V	

3. TUNING OSCILLATOR ADJUSTMENT

1) Set the channel set switch to ON on the rear panel.
2) Connect a frequency counter to P106 (Pin ⑴) on the Tuner PCB.
3) Adjust VR16 on the Tuner PCB so that a frequency of 15.625 Hz ±20 Hz is obtained.
4) Set the channel set switch back to OFF.

4. FREE RUN FREQUENCY ADJUSTMENT

1) Detach the antenna, establishing the "non-signal input" condition.
2) Apply DC 5V to IC101 (Pin ⑭) on the Tuner PCB, and stop the IF Amp. operation.
3) Connect the frequency counter to the collector of Q108 on the Tuner PCB.
4) Adjust L113 so that a frequency of 15.625 Hz ± 10 Hz is obtained.

5. TUNER ADJUSTMENT

Since the adjustment of the Tuner PCB requires a special jig, avoid touching the adjustment point. But should any adjustment become necessary, use the following adjustment method:

5-1. Prior to adjustment

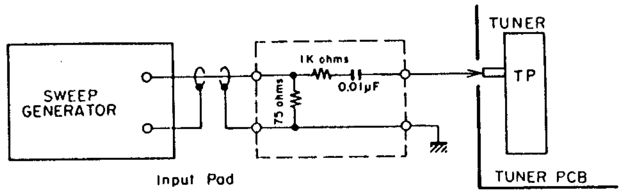


Fig. 6-4

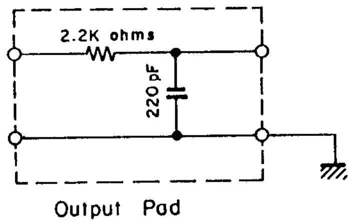


Fig. 6-5

1) Voltage check
   - a. IDL 12V (P101 Pins ⑹).....12.0V
   - b. TNR 12V (P101 Pin ⑦).....11.9V
   - c. FINE (P102 Pin ⑵).....5.75V
     5.3V (at AFT adjustment)
2) Antenna input signal levels: 70 dB or more
   EG.....VHF 12CH
   UHF 40CH
   EK.....UHF 30CH
3) The VH band is used for adjustment (or UHF on EK).

5-2. Tank Coil Adjustment

1) An IF frequency (EG : 38.9 MHz, EK : 39.5 MHz) is applied to the tuner's TP terminal via the input pad as shown in Fig. 6-4.
2) Set the sweep generator output to 50 mVP-P (non-modulated carrier signal).
3) Connect an oscilloscope (DC mode) to the emitter of TR102 via the output pad shown in Fig. 6-5.
4) Apply DC7-10V to Pin ⑭ (IF AGC) of IC101, and adjust T102 so that the TR102's emitter voltage is at its minimum.

5-3. AFT Adjustment

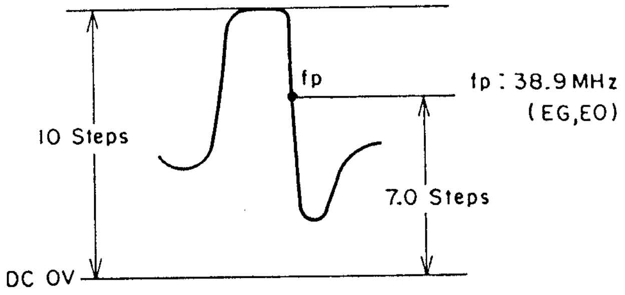


Fig. 6-6 EG/IEO AFT

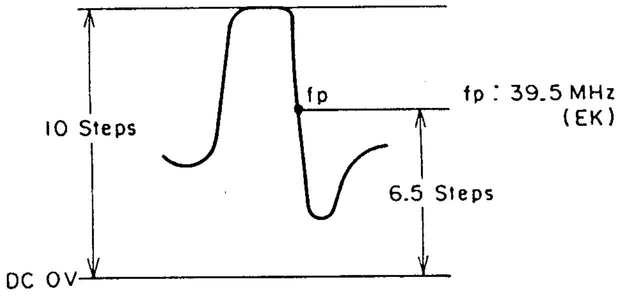


Fig. 6-7 EK AFT

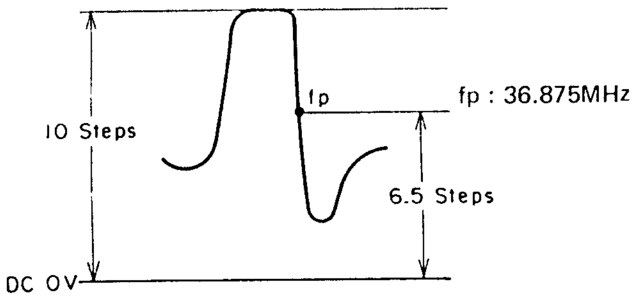


Fig. 6-8 EA AFT

1) Set the sweep generator to "Sweep", and connect it to the tuner's TP terminal via the input pad (Fig. 6-4).
2) Connect an oscilloscope (DC mode) to Pin ⑴ of P102.
3) Apply DC 8V to Pin ⑭ of IC101, and adjust T103 so that the condition shown in Fig. 6-6. Fig. 6-7 or Fig. 6-8 can be obtained.

5-4. VIF Adjustment

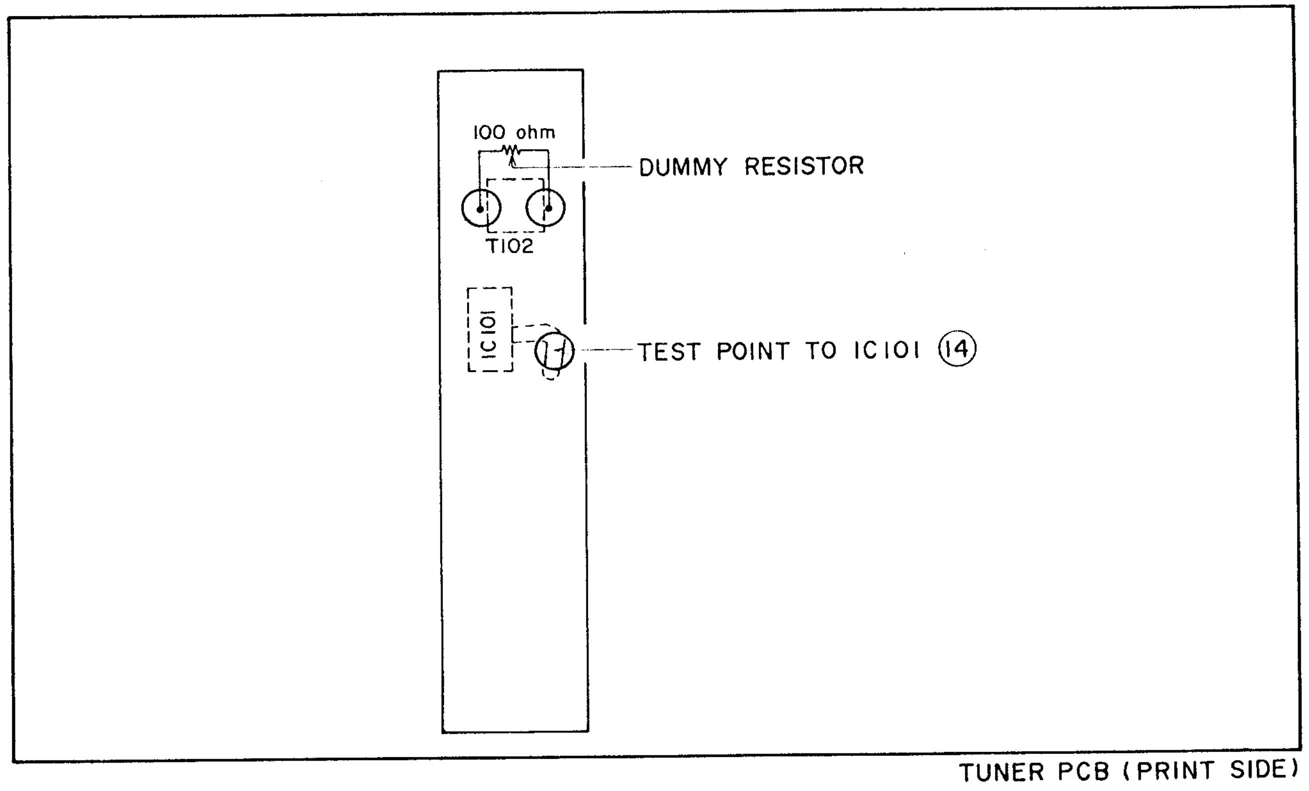


Fig. 6-9

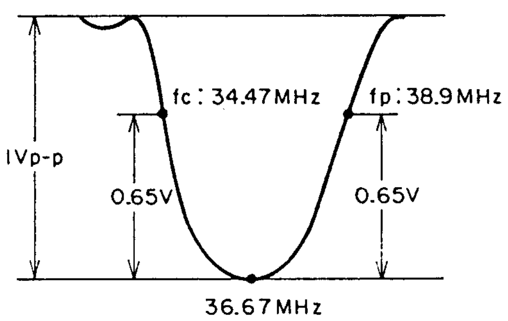


Fig. 6-10 EG/IEO IF

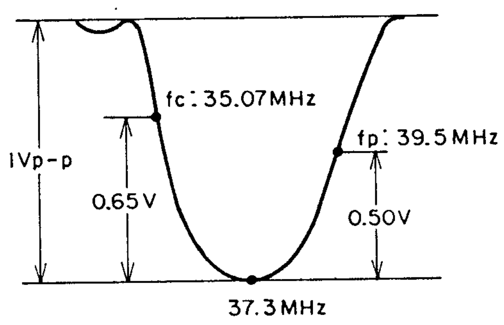


Fig. 6-11 EK IF

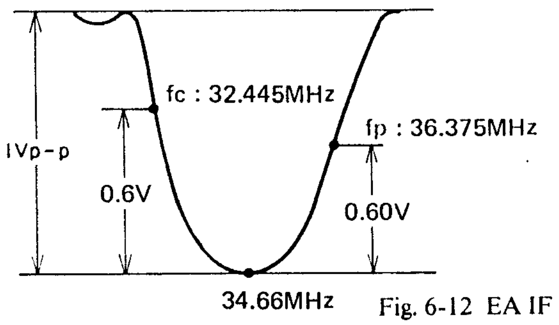


Fig. 6-12 EA IF

1) Connect the sweep generator as described in 5-3-1.
2) Connect the oscilloscope to the emitter of TR102 via the output pad (Fig. 6-5).
3) Attach a 100 ohms dummy resistor to the tank coil T102 (Fig. 6-9).
4) Apply 12V to Pin ⑭ of IC101, and set the sweep generator output so that an output of 1 Vp-p can be obtained.
5) Increase the sweep generator output by 20 dB and decrease voltage at Pin ⑭ of IC101 so that an output of 1 Vp-p can be obtained.
6) Adjust L103 so that the center frequency of the output waveform is at its peak. At this time, if necessary, adjust DC voltage at Pin ⑭ of IC101 so that an output of 1 Vp-p can be obtained. (Figs. 6-10, 6-11 and 6-12)
7) Detach the 100 ohms dummy resistor.
8) Adjust fp and fc level positions by means of the tuner IF coil. (Figs. 6-10, 6-11 and 6-12)

6. VIDEO OUTPUT LEVEL ADJUSTMENT

1) Supply the RF signal to Ant In.
2) Put 75 ohms between Video Out (P106's Pin ①) and earth, and connect an oscilloscope.
3) Receive an 87.5%-modulated signal (color bar) as the input signal and adjust VR104 so that the video output level is at 1 Vp-p.

7. RF AGC ADJUSTMENT

7-1. V. AGC Adjustment (Except EK Model)

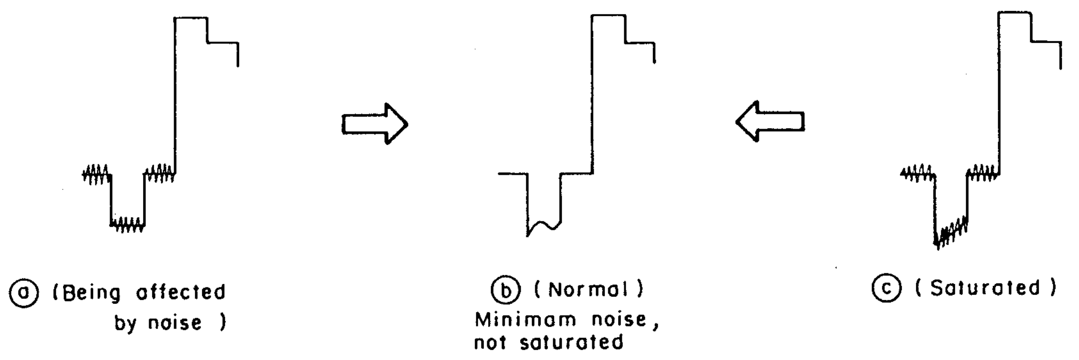

ⓐ (Being affected by noise)
ⓑ (Normal) Minimom noise, not saturated
ⓒ (Saturated)

Fig. 6-13

1) Make connections in the same manner as in 6-1. and 2. above.
2) Receive VH (70 dB or more), turn VR102, verify the change in output waveform, and adjust the VR102 while watching the H Sync pulse so that Fig. 6-13 ⓑ when there is no noise achieved from Fig. 6-13 ⓐ when there is lots of noise (See Fig. 6-13).

7-2. UHF AGC Adjustment

1) Make connections in the same manner as in 6-1. and 2. above.
2) Receive UHF (70 dB or more), turn VR101, verify the change in output waveform, and set the level at the proper position. (See Fig. 6-13)

8. AUDIO OUTPUT LEVEL ADJUSTMENT

1) Supply the RF signal (as modulated at 1 kHz or 400 Hz) to Ant. In.
2) Connect an AC voltmeter and distortion meter to Audio Out (P106's Pin ③).
3) Adjust L112 so that audio output level is at its maximum and distortion is minimized.
4) Adjust VR105 so that the audio output level is at −16 dB ± 2 dB.

9. FINE CONTROL VERIFICATION

1) Connect a DC voltmeter to Pin ② if P102.
2) Depress the "Fine (+)/(−)" button on the front panel and verify that the normal picture quality can be obtained at DC 16V.

10. AFT/AUDIO MUTE VERIFICATION

1) Connect a DC boltmeter to Pin ⑤ of P102.
2) Verify that AFT is ON and the Audio Out appears at DC 5V or so.

11. VIDEO SIGNAL DETECTOR VERIFICATION

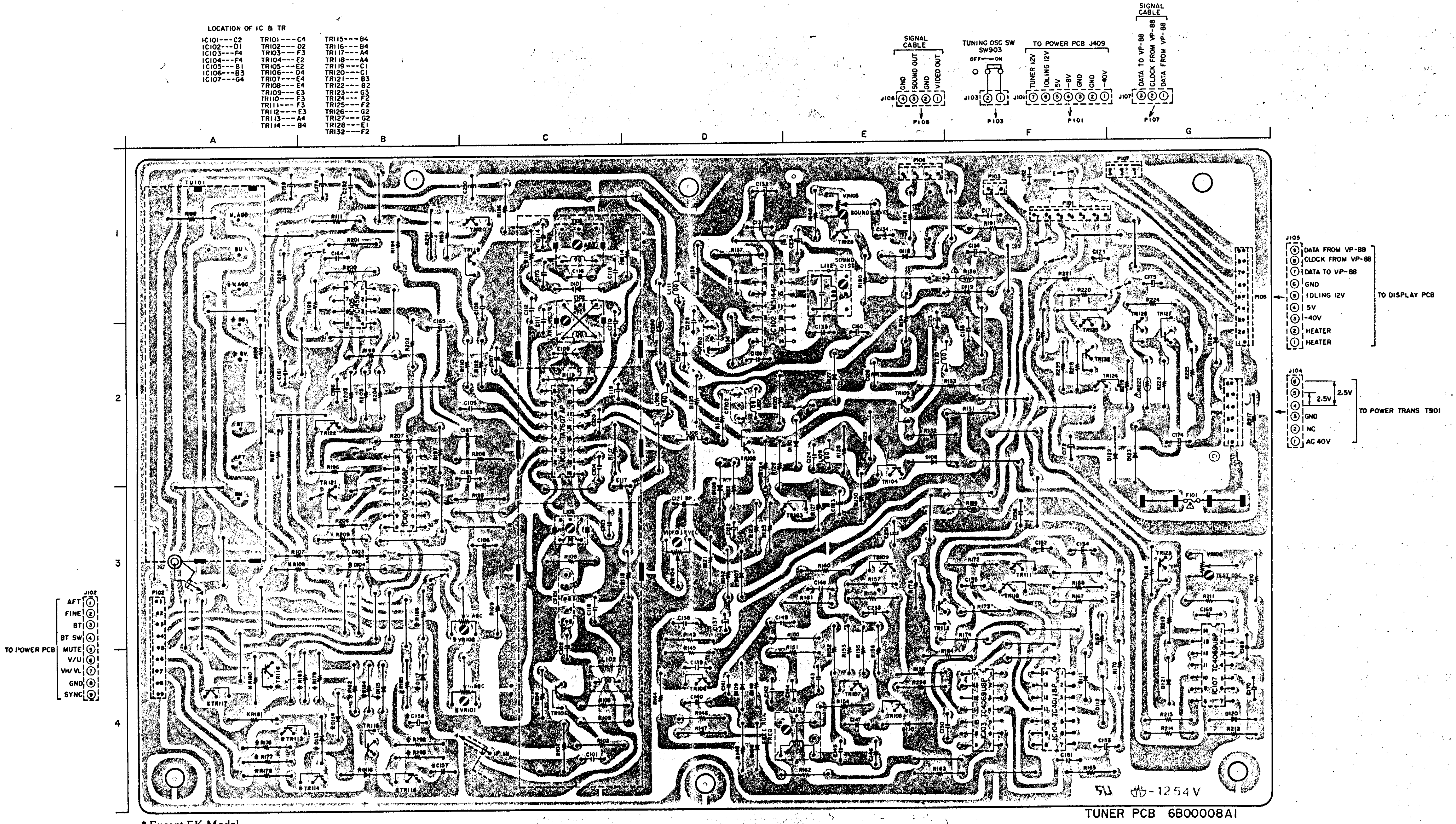
Verify that the audio mute operates when the antenna is disconnected from Ant In while both the picture and sound are being produced normally with the RF signal received.

VII. COMPOSITION OF VARIOUS P.C BOARDS

1. TUNER P.C BOARD 6B0008A1

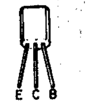
LOCATION OF IC & TR

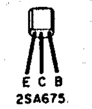
IC101---C2	TR101---C4	TR115---B4
IC102---D1	TR102---D2	TR116---B4
IC103---F4	TR103---F3	TR117---A4
IC104---F4	TR104---E2	TR118---A4
IC105---B1	TR105---E2	TR119---C1
IC106---B3	TR106---D4	TR120---C1
IC107---G4	TR107---E4	TR121---B3
	TR108---E4	TR122---B2
	TR109---E3	TR123---G3
	TR110---F3	TR124---F2
	TR111---F3	TR125---F2
	TR112---E3	TR126---G2
	TR113---A4	TR127---G2
	TR114---B4	TR128---E1
		TR132---F2

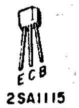

SIGNAL CABLE
GND
SOUND OUT
GND
VIDEO OUT
J106
P106
TUNING OSC SW
SW903
OFF—ON
J103
P103
TO POWER PCB J409
TUNER 12V
IDLING 12V
5V
-8V
GND
GND
-40V
J101
P101
SIGNAL CABLE
DATA TO VP-88
CLOCK FROM VP-88
DATA FROM VP-88
J107
P107
A
B
C
D
E
F
G
1
2
3
4
J105
⑨ DATA FROM VP-88
⑧ CLOCK FROM VP-88
⑦ DATA TO VP-88
⑥ GND
⑤ IDLING 12V
④ 5V
③ -40V
② HEATER
① HEATER
TO DISPLAY PCB
P105
J104
2.5V
2.5V
③ GND
② NC
① AC 40V
TO POWER TRANS T901
J102
AFT ①
FINE ②
BT ③
BT SW ④
MUTE ⑤
V/U ⑥
VH/VL ⑦
GND ⑧
SYNC ⑨
TO POWER PCB
TU101
IC101
IC102
IC103
IC104
IC105
IC106
IC107
VR101
VR102
VR103
VR106
SOUND LEVEL
VIDEO LEVEL
TEST OSC
F101
TUNER PCB 6B00008A1

* Except EK Model

TR101	2SC388A
TR102 to 104, 109 to 111, 113 to 116, 120, 123, 127, 128	2SC2603D, E
TR105, 108, 122	2SC1211D, E
TR106, 112, 119, 121, 132	2SA1115D, E
TR107	2SC2603E, F
TR117, 118	2SA950 OY
TR124, 125	2SA675
TR128	2SC2383


E C B
2SC1211
2SC2383

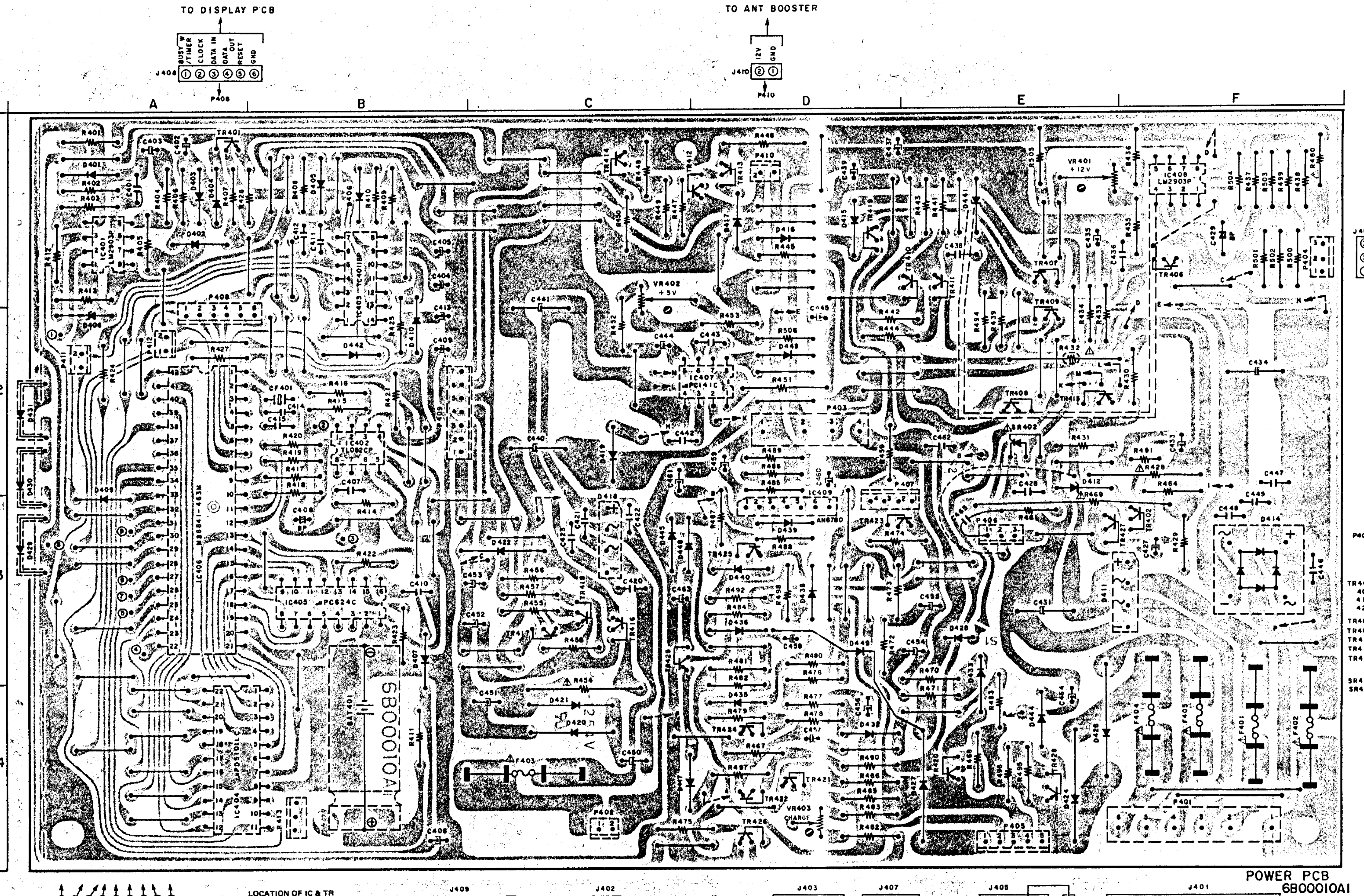

E C B
2SA675
2SA950
2SC388A

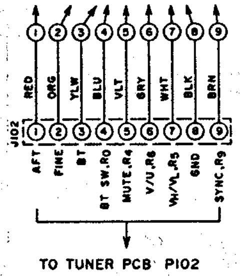

E C B
2SA1115
2SC2603

WARNING ⚠ INDICATES SAFETY CRITICAL COMPONENTS. FOR CONTINUED SAFETY, REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER'S RECOMMENDED PARTS.

AVERTISSEMENT ⚠ IL INDIQUE LES COMPOSANTS CRITIQUES DE SÉCURITÉ POUR MAINTENIR LE DEGRÉ DE SÉCURITÉ DE L'APPAREIL. NE REMPLACER QUE DES PIÈCES RECOMMANDÉES PAR LE FABRICANT

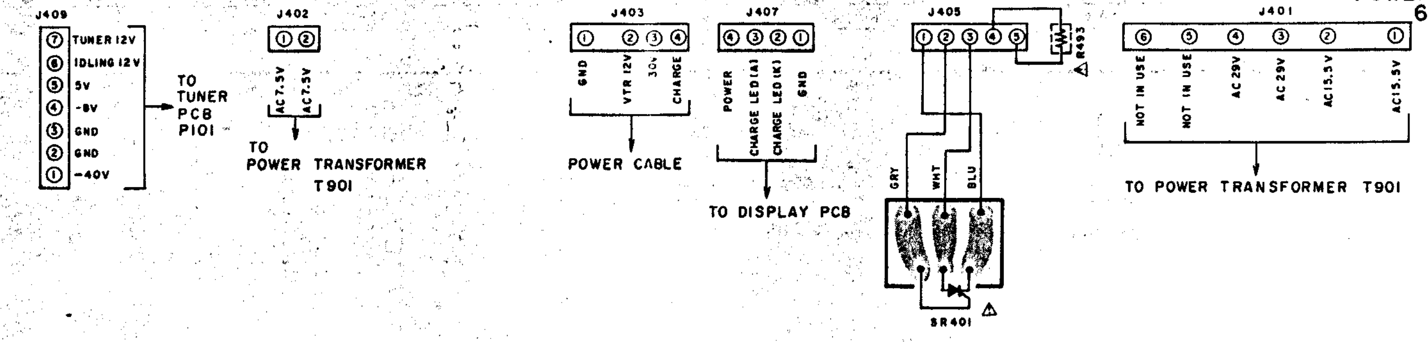
2. POWER P.C BOARD 6B00010A1

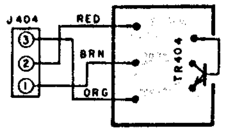

TO DISPLAY PCB
BUSY /TIMER
CLOCK
DATA IN
DATA OUT
RESET
GND
J408
P408
TO ANT BOOSTER
12V
GND
J410
P410
A
B
C
D
E
F
1
2
3
4
IC401 LM2903P
IC402 TL082CP
IC405 μPC624C
IC406 M58841-463M
IC407 μPC14 IC
IC408 LM2903P
IC409 AN6780
VR401 +12V
VR402 +5V
VR403 CHARGE
6B00010A
BATT
POWER PCB
6B00010A1

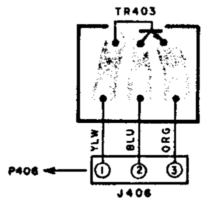

RED
ORG
YLW
BLU
VLT
GRY
WHT
BLK
BRN
J102
AFT
FINE
BT
BT SW,R0
MUTE,R4
V/U,R6
VH/VL,R5
GND
SYNC,R9
TO TUNER PCB P102

LOCATION OF IC & TR

IC401	A1	TR413	D1
IC402	B2	TR414	C1
IC403	B1	TR416	E2
IC404	A4	TR416	C3
IC405	B3	TR417	C3
IC406	A2, 3	TR418	C3
IC407	D2	TR419	D1
IC408	F1	TR420	E4
IC409	D3	TR421	D4
		TR422	D4
TR401	A1	TR423	D3
TR402	E3	TR424	D4
TR406	F1	TR425	D3
TR407	E1	TR426	D4
TR408	E2	TR427	E3
TR409	E2	TR428	E4
TR410	D2	TR429	D3
TR411	E2		
TR412	D1	SR402	E2


J409
TUNER 12V
IDLING 12V
5V
-8V
GND
GND
-40V
TO TUNER PCB P101
J402
AC7.5V
AC7.5V
TO POWER TRANSFORMER T901
J403
GND
VTR 12V
30V
CHARGE
POWER CABLE
J407
POWER
CHARGE LED(A)
CHARGE LED(K)
GND
TO DISPLAY PCB
J405
R493
GRY
WHT
BLU
SR401
J401
NOT IN USE
NOT IN USE
AC 29V
AC 29V
AC15.5V
AC15.5V
TO POWER TRANSFORMER T901

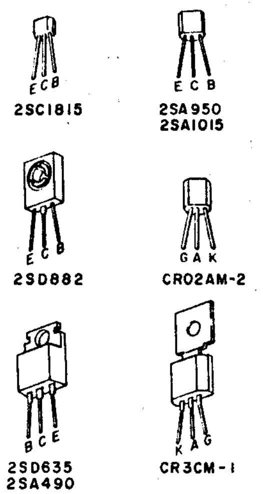

J404
RED
BRN
ORG
TR404


TR403
YLW
BLU
ORG
P406
J406

TR401, 402, 406, 407
409, 410, 411, 413
414, 419, 421, 422
423, 424, 426, 429 -- 2SC1815 (O,Y)

TR403, 404 ---------- 2SD635
TR408 ---------- 2SD882
TR412 ---------- 2SA950 (O,Y)
TR415 ---------- 2SA490
TR416, 417, 418, 420
425, 427, 428 -- 2SA1015 (O,Y)

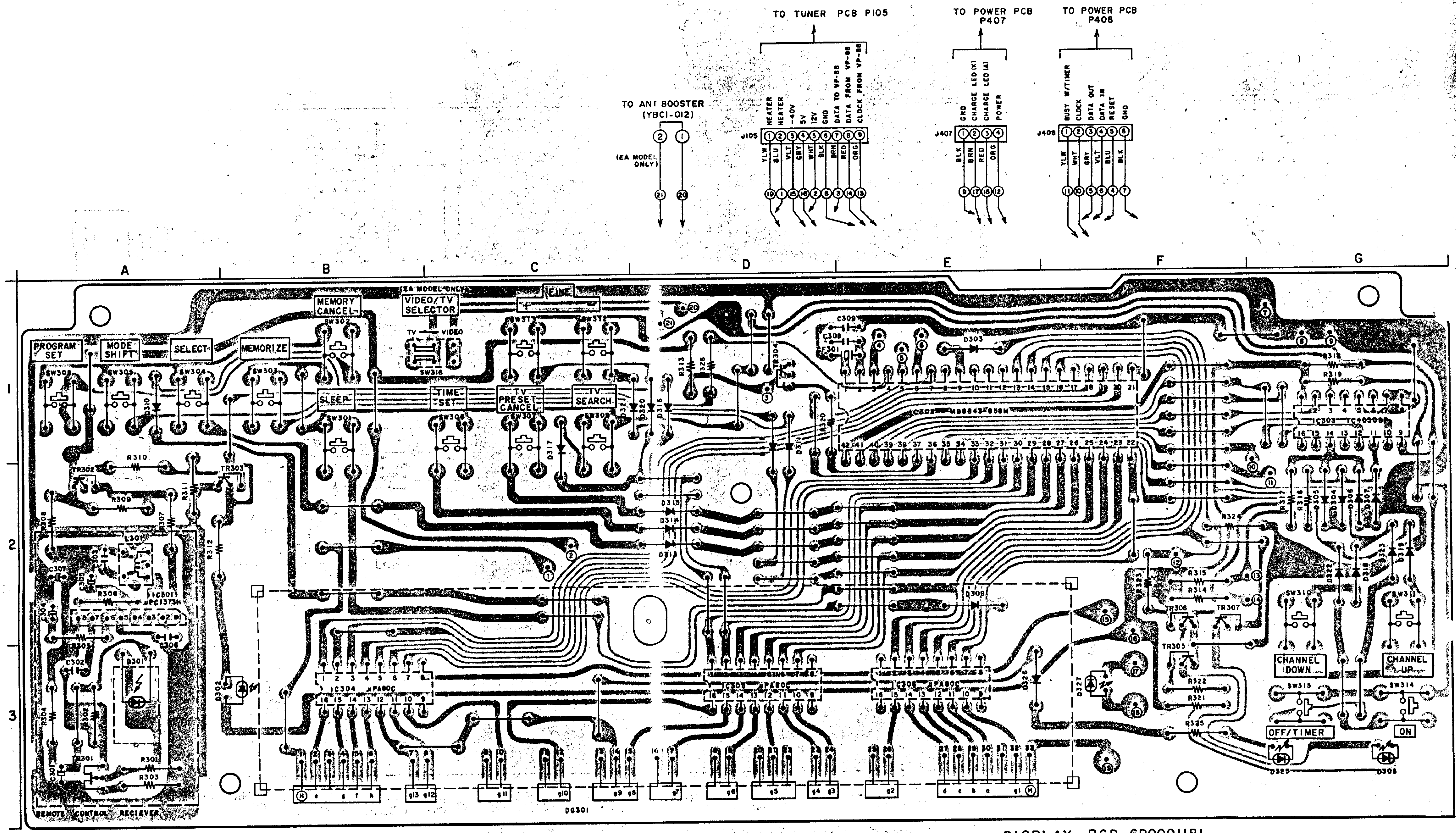
SR401 ---------- CR3CM-1
SR402 ---------- CR02AM-2


E C B
2SC1815
E C B
2SA950
2SA1015
E C B
2SD882
G A K
CR02AM-2
B C E
2SD635
2SA490
K A G
CR3CM-1

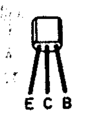
WARNING ⚠ INDICATES SAFETY CRITICAL COMPONENTS FOR CONTINUED SAFETY REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER'S RECOMMENDED PARTS

AVERTISSEMENT ⚠ IL INDIQUE LES COMPOSANTS CRITIQUES DE SECURITÉ POUR MAINTENIR LE DEGRÉ DE SECURITÉ DE L'APPAREIL NE REMPLACER QUE DES PIECES RECOMMANDEES PAR LE FABRICANT

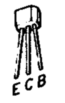
3. DISPLAY P.C BOARD 6B00011B1


TO TUNER PCB P105
TO POWER PCB P407
TO POWER PCB P408
TO ANT BOOSTER (YBCI-012)
(EA MODEL ONLY)
J105
HEATER
HEATER
-40V
5V
12V
GND
DATA TO VP-88
DATA FROM VP-88
CLOCK FROM VP-88
YLW
BLU
VLT
GRY
WHT
BLK
BRN
RED
ORG
J407
GND
CHARGE LED (K)
CHARGE LED (A)
POWER
BLK
BRN
RED
ORG
J408
BUSY W/TIMER
CLOCK
DATA OUT
DATA IN
RESET
GND
YLW
WHT
GRY
VLT
BLU
BLK
A
B
C
D
E
F
G
1
2
3
PROGRAM SET
MODE SHIFT
SELECT
MEMORIZE
MEMORY CANCEL
(EA MODEL ONLY)
VIDEO/TV SELECTOR
TV
VIDEO
FINE
SLEEP
TIME SET
TV PRESET CANCEL
TV SEARCH
SW301
SW302
SW303
SW304
SW305
SW306
SW307
SW308
SW309
SW310
SW311
SW312
SW313
SW314
SW315
SW316
CHANNEL DOWN
CHANNEL UP
OFF/TIMER
ON
IC301 μPC1373H
IC302 MB8843-658M
IC303 TC4069UB
IC304 μPA80C
IC305 μPA80C
IC306 μPA80C
TR301
TR302
TR303
TR304
TR305
TR306
TR307
L301
D301
D302
D303
D305
D306
D307
D308
D309
D310
D313
D314
D315
D316
D317
D318
D319
D320
D321
D322
D323
D324
D325
D326
D327
R301
R302
R303
R304
R305
R306
R307
R308
R309
R310
R311
R312
R313
R314
R315
R316
R317
R318
R319
R320
R321
R322
R323
R324
R325
R326
C301
C302
C303
C304
C305
C306
C307
C308
C309
REMOTE CONTROL RECIEVER
DG301
g1
g2
g3
g4
g5
g6
g7
g8
g9
g10
g11
g12
g13
H

DISPLAY PCB 6B00011B1



2SA1015



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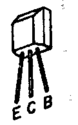
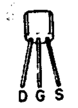


2SB605



2SK163

TR301 -----------2SK163
TR302 -----------2SA1015 (O,Y)
TR303 to 306 -------2SC1815 (O,Y)
TR307-----------2SB605 (L,K)

LOCATION OF IC & TR

IC301.	A2	TR301	A3
IC302.	E1	TR302	A2
IC303.	G1	TR303	B2
IC304.	B3	TR304	D1
IC305.	D3	TR305	F3
IC306.	E3	TR306	F2
		TR307	F2

MEMO

SECTION 4

PARTS LIST

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Please refer to COMMON LIST FOR SERVICE PARTS, for Resistor and Capacitor which are not listed in this parts list.

ATTENTION

1. When placing an order for parts, be sure to list the parts no. model no., and description. There are instances in which if any of this information is omitted, parts cannot be shipped or the wrong parts will be delivered.
2. Please be careful not to make a mistake in the parts no. If the parts no. is in error, a part different from the one ordered may be delivered.
3. Because parts number and parts unit supply in the Preliminary Parts List may be partially changed, please use this parts list for all future reference.

HOW TO USE THIS PARTS LIST

1. This Parts List shows the parts that are considered necessary for repairs. Other parts, such as resistors and capacitors, are shown in the "Common List for Service Parts". Select and order such parts from the "Common List for Service Parts".
2. The Recommended Spare Parts shows those parts in the Parts List which are considered particularly important for service.
3. Parts not shown in the Parts List and "Common List for Service Parts" will not be supplied in principle.
4. How to read list
   a) Mechanism Block

2. HEAD BASE BLOCK

REF. NO.	PARTS NO.	DESCRIPTION
2-1x	BH-T2023A320A	HEAD BASE BLOCK GX-F66R
2-2	HP-H2206A010A	HEAD R/P PR4-8FU C
2-3	ZS-477876	PAN20x03STL CMT
2-4	ZS-536488	BID20x08STL CMT
2-5	ZG-402895	CS ANGLE ADJUST SPRING

SP (Service Parts) Classification

A small "x" indicates the inability to show that particular part in the Photo or Illustration.

This number corresponds with the individual parts index number in that figure

This number corresponds with the Figure Number

   b) P.C Board Block

6. SYS. CON. P.C BOARD BLOCK

REF. NO.	PARTS NO.	DESCRIPTION
6-1	BA-T2034A070A	PC SYS CON BLK GX-F44R
6-IC1	EI-324536	IC HD14049BP
6-IC2	EI-336801	IC MB8841-564M
6-IC3	EI-331661	IC SN7405N
6-IC4	EI-336725	IC M54527P
6-TR1to4	ET-200985	TR 2SC2603 F,G
6-TR5to28	ET-554657	TR 2SA733A P,Q
6-D1	ED-318292	D SILICON H 1S2473T-77 T26
6-D2to4	ED-308952	D GERMA V 1K34A-LR F07
6-D5to10	ED-318292	D SILICON H 1S2473T-77 T26
6-X1	EI-318384	OSC X'TAL NC-18C 3.579545MHZ

SP (Service Parts) Classification

This reference numbers corresponds with symbol numbers of Schematic Diagrams.

5. Both the kind of part and installation position can be determined by the Parts Number. To determine where a parts number is listed, utilize Parts Index at end of Parts List. It is necessary first of all to find the Parts Number. This can be accomplished by using the Reference Number listed at right of parts number in the Parts Index.

WARNING

⚠ INDICATES SAFETY CRITICAL COMPONENTS. FOR CONTINUED SAFETY, REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER'S RECOMMENDED PARTS.

AVERTISSEMENT

⚠ IL INDIQUE LES COMPOSANTS CRITIQUES DE SÉCURITÉ. POUR MAINTENIR LE DEGRÉ DE SÉCURITÉ DE L'APPAREIL, NE REMPLACER QUE DES PIÈCES RECOMMANDEES PAR LE FABRICANT

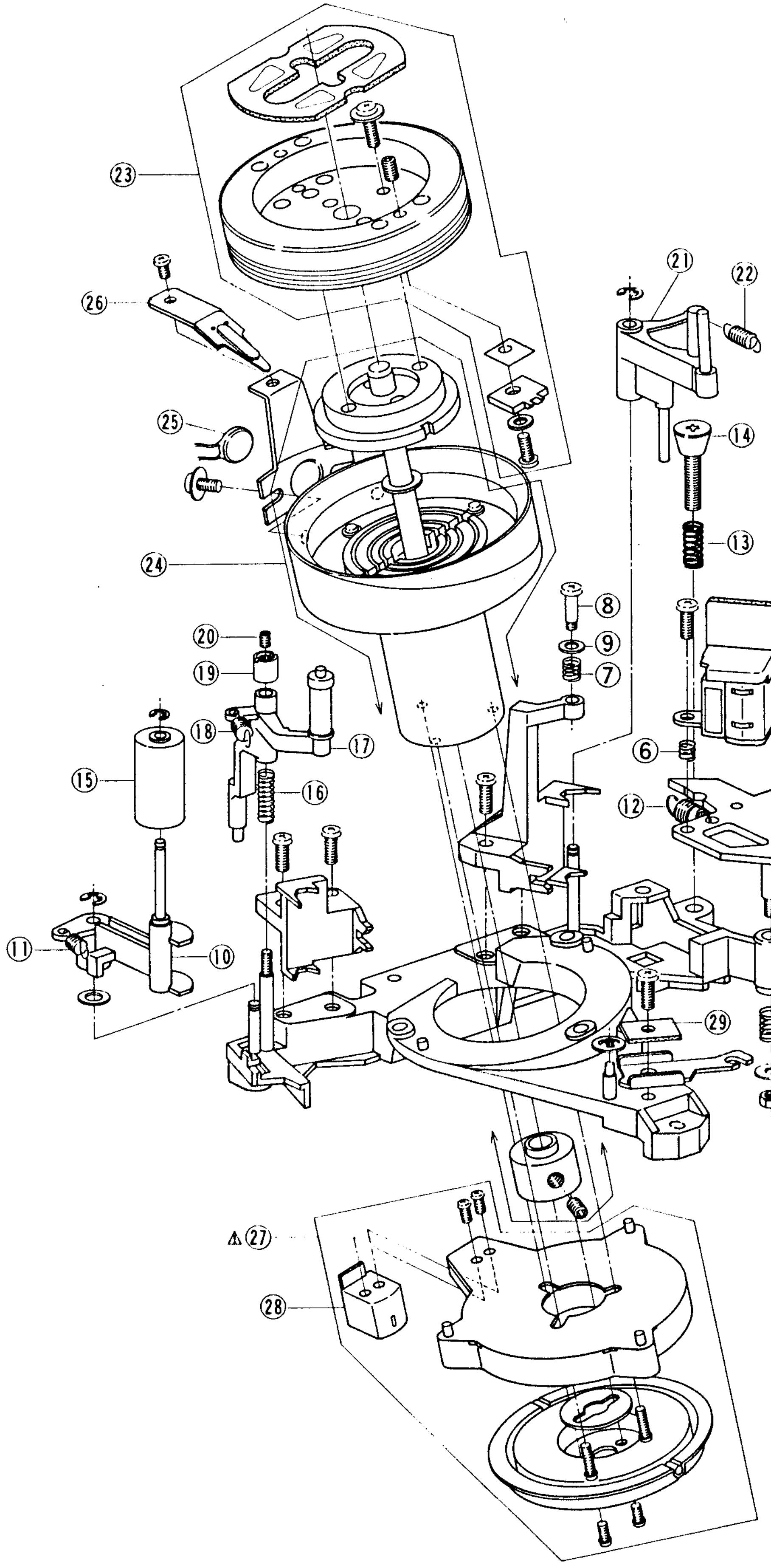
I. MODEL VP-88EG/EK/EA/EGN

RECOMMENDED SPARE PARTS

Because, if the parts listed below are on hand, almost any repair can be accomplished, we suggest that you stock these Recommended Spare Parts Items.

REF. NO.	PARTS NO.	DESCRIPTION
1	AX-332302	BATTERY
2	BF-B332870	FLYWHEEL PART
3	BH-336827	HEAD COMBO HV225331
4	BH-V2004A250A	LOWER DRUM BLK VP-88EG
5	BH-V2004A260A	UPPER DRUM BLK VP-88EG
6	BM-780049	⚠ L MOTOR SUB ASSY (2)
7	BM-332351	⚠ MOTOR
8	BM-337656	⚠ MOTOR VY220B14
9	BR-336395	TU REEL TABLE ASSY
10	BV-327845	EJECTER ASSY
11	BV-336067	IDLER ASSY
12	BV-332304	RF CONVERTER MBK3-353 (EK)
13	BV-332303	RF CONVERTER MDK3-353 (EG/EGN)
14	BV-332305	RF CONVERTER MSK2-083 (EA)
15	EC-338459	C S-FIX H ECV-1ZW25×53T 3.8-28
16	EC-332293	OSC CE EFO-A01 3.58MHz
17	ED-332283	D LED SG205D GRN
18	ED-318988	D LED SR505D RED
19	ED-332289	D SILICON ERA81-004 40/1.0A
20	ED-344280	D SILICON H GMA-01-4
21	ED-332270	D SILICON H 1SS133
22	ED-309437	D SILICON H 1S1926-M
23	ED-200468	D SILICON V DS448-VB6
24	ED-224526	D SILICON 10D1 100/1.0A
25	ED-322299	D SILICON 10D1FA-2 F12 100/1.0A
26	ED-338568	D ZENER H EZ-081
27	ED-338569	D ZENER H RD-3.0E L
28	ED-315367	D ZENER H WZ-050
29	ED-555895	D ZENER H WZ-065
30	ED-322809	D ZENER H WZ-081
31	ED-338586	D ZENER H XZ-070
32	ED-338587	D ZENER H XZ-100
33	ED-332296	PHOTO SENSER GP-2L02
34	ED-338226	POSISTOR PTH499D20BF200N030
35	EF-306952	⚠ FUSE TSC A 250V 4A (F1)
36	EI-337969	DL EFD-YN645A13A
37	EI-332318	DL MS-15L-7 (EGN)
38	EI-332269	DL MS-18S-2
39	EI-321604	IC AN6341N
40	EI-324203	IC AN6342N
41	EI-326044	IC AN6350
42	EI-336787	IC AN6564
43	EI-332286	IC BA5102
44	EI-328598	IC DN850
45	EI-332254	IC HA11714
46	EI-332255	IC HA11715
47	EI-332266	IC HA11724
48	EI-332267	IC HA11725
49	EI-332317	IC HA11741
50	EI-332285	IC HA13002
51	EI-325992	IC HD14024BP
52	EI-328593	IC HD14053BP
53	EI-332282	IC LM2901
54	EI-332260	IC MB8851M-231L
55	EI-332281	IC MC14077
56	EI-319496	IC MC14539BCP
57	EI-332287	IC M54517P
58	EI-213390	IC NJM4558D
59	EI-332257	IC NJM555
60	EI-313797	IC TC4001BP
61	EI-304657	IC TC4011BP
62	EI-332259	IC TC4052BP
63	EI-332279	IC TMS1100/M34026
64	EI-309878	OSC X'TAL 4.433619 MHz
65	EI-322347	OSC X'TAL 4.435571 MHz
66	EJ-200618	⚠ SOCKET INLET HEC470-630 (J2)
67	EJ-332295	PHONE J 2P HSJ0409-030 3.5
68	EJ-780057	PIN J W/SW HJW0001-01A
69	EJ-780054	PLUG COAX HXC0228-01A
70	EJ-332377	PLUG 10P CONNECTOR RM215TRE-10SE 10P
71	EJ-780056	SOCKET 4P TCS0145-10A
72	EJ-780055	SOCKET 5P W/SW TCS3554-10A
73	EL-330446	PL SPL HOLDER LAMP
74	EM-332350	IND FL AM806
75	EP-336718	⚠ SOLENOID W/TAP 0840PHT
76	EP-332383	⚠ SOLENOID W/TAP 1032PLT
77	EP-337885	RELAY SIG FBR211AD012-P 1TR 12V
78	EP-337886	RELAY SIG FBR221D009 2TR 9V
79	EP-337185	RELAY SIG G2E 1TR 9V
80	ER-337694	CR COMP EXR-P103P682S
81	ER-332342	FILTER LC AP ELB-5F031 (EG/EGN)
82	ER-332344	FILTER LC BP ELB-5F029 4.43MHz
83	ER-332345	FILTER LC BP ELB-5F030 5.06 MHz
84	ER-332339	FILTER LC HP ELB-5D007
85	ER-338167	FILTER LC LP ELB-5D008
86	ER-332347	FILTER LC LP ELB-5E017
87	ER-332341	FILTER LC LP ELB-5G008
88	ER-332343	FILTER LC LP ZLB-5E272
89	ES-318284	SW LEVER SCL101R23A 1-01-02N
90	ES-319124	SW LEVER SCL101S 1-01-02N
91	ES-332384	SW MICRO SS-5-F
92	ES-338395	SW SLID HSW0690-200 2-02-03
93	ES-338405	SW SLIDE HSW0669-010 2-02-03W (EGN)
94	ES-332277	SW TACT EVQ-QJ104K
95	ET-338414	POSISTER PTH61G11BD2R2N
96	ET-324539	TR PHOTO PT-410C C
97	ET-324539	TR PHOTO PT-410C C
98	ET-322778	TR 2SA608K-NP E, F, G
99	ET-332311	TR 2SA608SP D, E, F, G
100	ET-337698	TR 2SA608SP F
101	ET-332312	TR 2SA608SP F, G
102	ET-257253	TR 2SB605 K, L, M
103	ET-200415	TR 2SB641 Q, R, S
104	ET-339846	TR 2SB761 P, Q
105	ET-332332	TR 2SB772 P, Q, R
106	ET-332422	TR 2SB774 Q, R, S
107	ET-338424	TR 2SB941 Q, R, S
108	ET-332301	TR 2SC1047 D, E
109	ET-337182	TR 2SC1061 B, C, D
110	ET-325899	TR 2SC1983 R
111	ET-322775	TR 2SC536K-NP E, F, G
112	ET-328272	TR 2SC536K-NP F
113	ET-332314	TR 2SC536SP D, E, F, G
114	ET-332313	TR 2SC536SP E, F, G
115	ET-337697	TR 2SC536SP F
116	ET-337697	TR 2SC536SP F
117	ET-200741	TR 2SD571 K, L, M
118	ET-200412	TR 2SD636 Q, R, S
119	ET-309434	TR 2SD636 Q, R, S, T
120	ET-332310	TR 2SD638P, Q, R
121	ET-332349	TR 2SD826 E, F, G
122	ET-337747	TR 2SD879
123	ET-337332	TR 2SD992 K, L, M
124	EV-336802	C S-FIX H ECV-1ZW06×53T 2.0–8
125	EV-200461	R S-FIX H EVN38 3P 103
126	EV-307653	R S-FIX H H0651A 3P 0.05W 102
127	EV-307621	R S-FIX H H0651A 3P 0.05W 103
128	EV-332319	R S-FIX H H0651A 3P 0.05W 221
129	EV-307620	R S-FIX H H0651A 3P 0.05W 222
130	EV-307706	R S-FIX H H0651A 3P 0.05W 471
131	EV-341228	R S-FIX H KVSF807V 3P 105
132	EV-337957	R S-FIX H TM64K3 3P 0.30W 102
133	EV-337949	R S-FIX H TM64K3 3P 0.30W 103
134	EV-337945	R S-FIX H TM64K3 3P 0.30W 104
135	EV-337952	R S-FIX H TM64K3 3P 0.30W 105
136	EV-337948	R S-FIX H TM64K3 3P 0.30W 203 (EGN)
137	EV-337951	R S-FIX H TM64K3 3P 0.30W 303
138	EV-337946	R S-FIX H TM64K3 3P 0.30W 501
139	EV-337953	R S-FIX H TM64K3 3P 0.30W 503
140	EV-337947	R S-FIX H TM64K3 3P 0.30W 504
141	EV-337950	R S-FIX H TM64K3 3P 0.30W 683
142	EV-337181	VR ROTARY 16P10×1F B203
143	EV-332327	VR ROTARY 16P10×1G B504
144	EV-332253	VR ROTARY 16P10×1H B104
145	HE-337628	HEAD E HV113202
146	MB-332872	BELT CAPSTAN
147	MB-780051	LOADING BELT (2)
148	MI-332999	ROLLER IMPEDANCE
149	MP-V2004A120A	ROLLER PINCH BLK VP-88EG
150	VT-318213	HEAD PU SS-6EMC

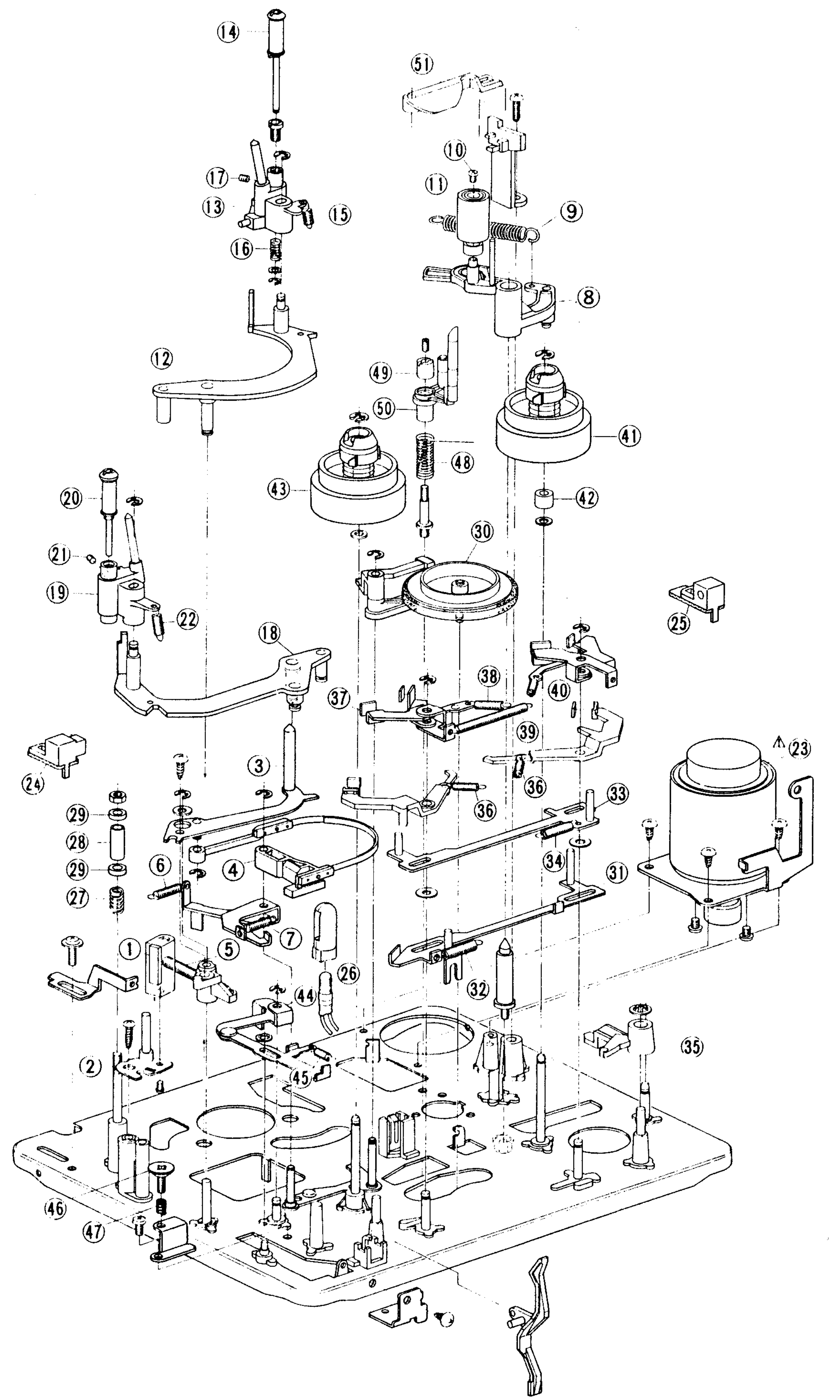
HEAD DRUM BLOCK



1. HEAD DRUM BLOCK

REF. NO.	PARTS NO.	DESCRIPTION
	HEAD DRUM BLOCK	
1-1	BH-336827	HEAD COMBO HV225331
1-2	HZ-342725	GUIDE TAPE (A)
1-3	HZ-342726	GUIDE TAPE (B)
1-4	ZG-328225	SP C-3.5/0.8-10.0G C102G
1-5	ZG-327757	SP PULL ACH SET
1-6	ZG-313257	SP C-3.5/0.8-8.0 C-101
1-7	ZG-330641	SP PUSH ACH
1-8	ZS-341951	SCREW ADJUST CUE
1-9	ZW-301359	PW30×060×050STL CMT
1-10	BL-B332875	ARM IMPEDANCE ROLLER (S) PART
1-11	ZG-318228	SP T2-3.2/0.29-14 T2-061
1-12	ZG-331178	SP PUSH PRESS ACH
1-13	ZG-332979	SP PUSH CTL (B)
1-14	ZS-332978	SCREW ADJUST
1-15	MI-332999	ROLLER IMPEDANCE
1-16	ZG-313166	SP C-3.5/0.32-16.0 C-014
1-17	BL-B604413	ARM CUE (L) PART
1-18	ZG-332904	SP PULL CUE ARM (L)
1-19	ZS-326246	NUT ADJUST
1-20	ZS-328608	6SET26×030SCM PKR FP
1-21	BL-B332877	ARM CUE (R) PART
1-22	ZG-332912	SP PULL CUE ARM (R)
1-23	BH-V2004A260A	UPPER DRUM BLK VP-88EG
1-24	BH-V2004A250A	LOWER DRUM BLK VP-88EG
1-25	ED-338226	POSISTOR PTH499D20BF200N030
1-26	BV-342208	HOLDER EARTH ASSY
	ASSEMBLY BLOCK	
1-27	BM-332351	⚠ MOTOR
1-28	VT-318213	HEAD PU SS-6EMC
1-29	ED-332382	DEW SENSOR HOS003-130

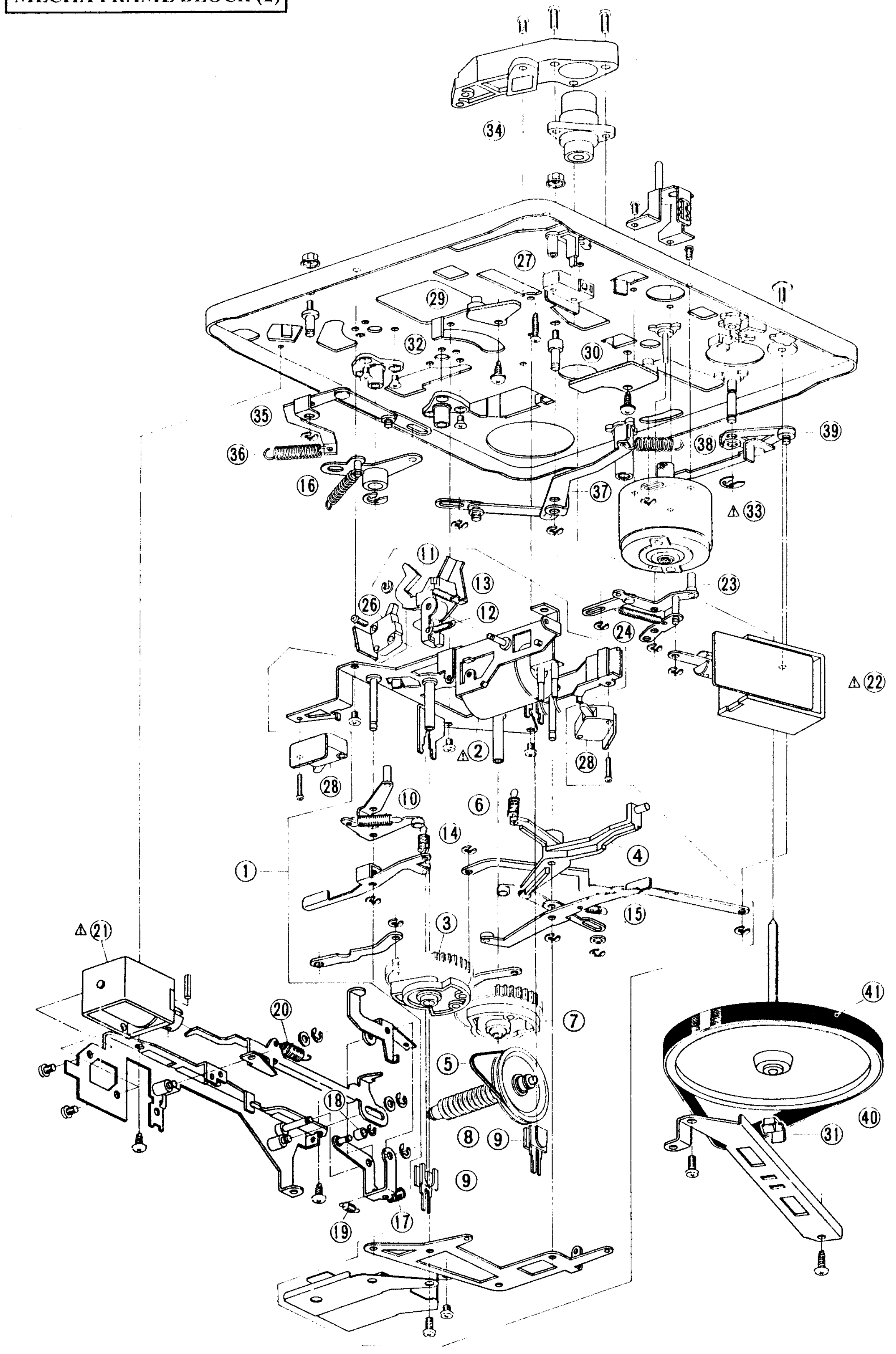
MECHA FRAME BLOCK (1)



2. MECHA FRAME BLOCK (1)

REF. NO.	PARTS NO.	DESCRIPTION
	HOLDER ERASE HEAD BLOCK	
2-1	HE-337628	HEAD E HV113202
2-2	HZ-B321740	HOLDER EH PART
	TENSION ARM BLOCK	
2-3	BL-B326468	LEVER TENSION PART
2-4	VT-332997	TENSION BAND ASSY
2-5	ZG-331128	SP T2-4.0/0.4-45 T2-120
	LEVER TENSION RELEASE BLOCK	
2-6	ZZ-332909	SP PULL TENSION SET
2-7	ZG-318223	SP T2-3.2/0.29-18 T2-063
	LEVER PINCH ROLLER BLOCK	
2-8	BV-B332866	LEVER PINCH ROLLER PART
2-9	ZG-342091	SP PULL PINCH ROLLER
2-10	ZS-477876	PAN20×03STL CMT
2-11	MP-V2004A120A	ROLLER PINCH BLK VP-88EG
	LEVER LOADING (R) BLOCK	
2-12	BL-B326347	LEVER LOADING (R) PART
2-13	BV-B604291	LOADING LEADER (R) PART
2-14	VT-336066	VERTICAL POLE (R) ASSY
2-15	ZG-318043	SP LEADER
2-16	ZG-332902	SP PUSH VERTICAL SHAFT SET
2-17	ZS-332891	SCREW SET
	LEVER LOADING (L) BLOCK	
2-18	BL-B326329	LEVER LOADING (L) PART
2-19	VT-B319445	LOADING LEADER (L) PART
2-20	VT-336393	VERTICAL POLE (L) ASSY
2-21	ZS-332891	SCREW SET
2-22	ZG-318043	SP LEADER
	CAPSTAN MOTOR BLOCK	
2-23	BM-338393	⚠ MOTOR FG 4322 010 75762
	SENSOR (R) P.C BOARD BLOCK	
2-24	ET-324539	TR PHOTO PT-410C C (TR902)
	SENSOR (L) P.C BOARD BLOCK	
2-25	ET-324539	TR PHOTO PT-410C C (TR901)
	MECHA FRAME BLOCK	
2-26	EL-330446	PL SPL HOLDER LAMP
2-27	ZG-328225	SP C-3.5/0.8-10.0G C-102G
2-28	HZ-342725	GUIDE TAPE (A)
2-29	HZ-342726	GUIDE TAPE (B)
2-30	BV-336067	IDLER ASSY
2-31	BL-B322090	LEVER BRAKE SLIDE (B) PART
2-32	ZG-332910	SP PULL BRAKE
2-33	BL-B322027	LEVER BRAKE SLIDE (A) PART
2-34	ZG-324331	SP T2-3.2/0.2-12.5 T2-041
2-35	ML-330640	LEVER BRAKE RELEASER
2-36	ZG-328659	SP T2-3.2/0.2-16 T2-043
2-37	VT-322159	SHEET BRAKE (A)
2-38	ZG-318228	SP T2-3.2/0.29-14 T2-061
2-39	ZG-312955	SP T1-3.2/0.29-40.0 T1-070
2-40	ZG-321549	SP T2-3.2/0.2-10.0 T2-039
2-41	BR-336395	TU REEL TABLE ASSY
2-42	MT-317774	REEL TABLE COLLER
2-43	BR-336394	SUPPLY REEL TABLE ASSY.
	ASSEMBLY BLOCK	
2-44	BL-B332874	LEVER RELEASE (C) PART
2-45	ZG-318228	SP T2-3.2/0.29-14 T2-061
2-46	ZS-332858	SCREW ADJUST
2-47	ZG-332911	SP PUSH
2-48	ZG-326247	SP TORSION REVIEW
2-49	ZS-326246	NUT ADJUST
2-50	BL-B326220	LEVER REVIEW PART
2-51	VT-326477	GUIDE CAP

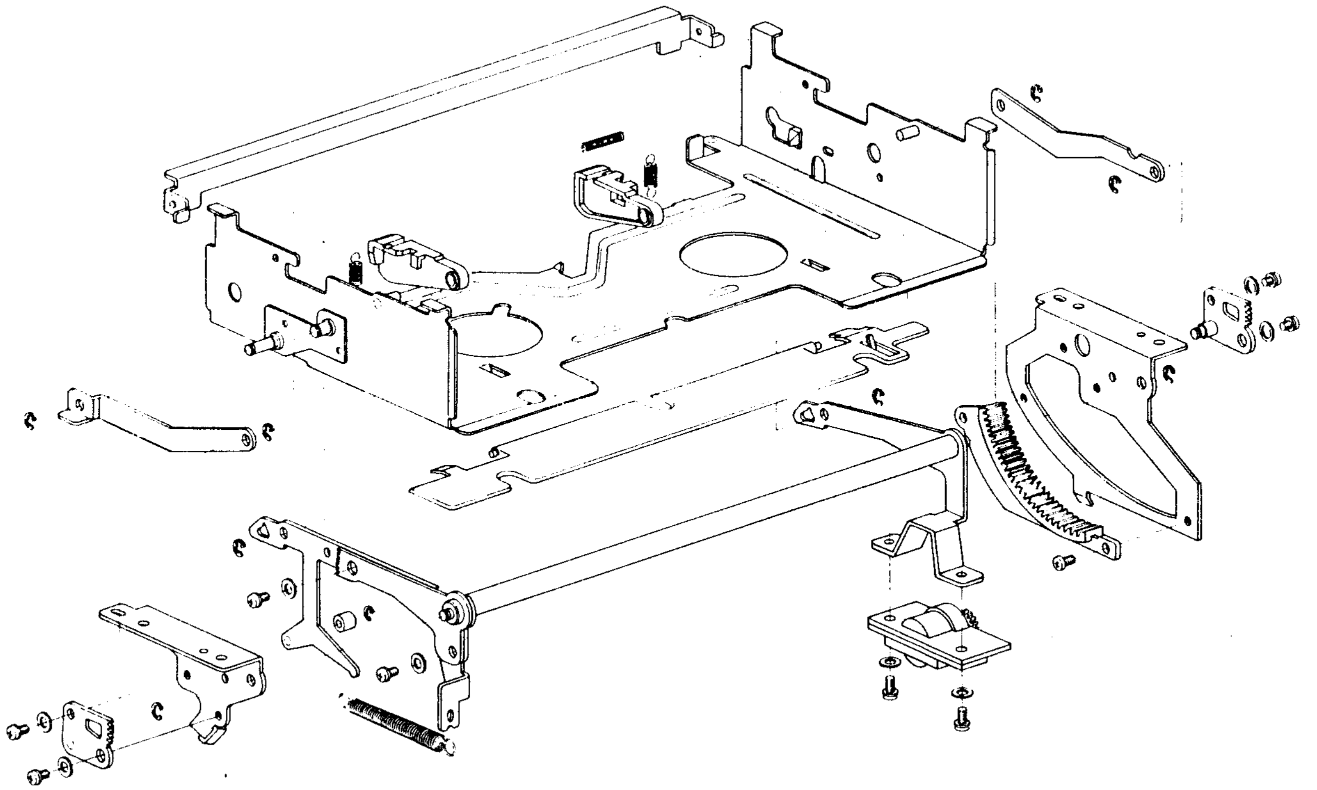
MECHA FRAME BLOCK (2)



3. MECHA FRAME BLOCK (2)

REF. NO.	PARTS NO.	DESCRIPTION
	LOADING BLOCK	
3-1	BV-V2004A070A	⚠ LOADING BLK VP-88EG
3-2	BM-780049	⚠ L MOTOR SUB ASSY (2)
3-3	BL-780050	GEAR L (A) ASSY
3-4	BL-780052	BRAKE LEVER ASSY
3-5	MB-780051	LOADING BELT (2)
3-6	ZG-780053	SP BRAKE LEVER (2)
3-7	VT-780026	LOADING GEAR B SUB ASSY
3-8	VT-780027	LOADING WARM ASSY
3-9	VT-780028	HOLDER GEAR SHAFT
3-10	ZG-780032	SP TENSION LEVER RETURN
3-11	ML-780036	LOCK ARM (A)
3-12	ZG-780037	SP LOCK RETURN
3-13	ZG-780038	SP LOCK HOLD
3-14	ZG-780039	SP SW A
3-15	ZG-780040	SP SW B
	CUE PLUNGER BLOCK	
3-16	ZG-332907	SP PULL UNLOADING (R)
3-17	ZG-332906	SP PULL LOWER
3-18	MR-332883	ROLLER CUE
3-19	ZG-324329	SP T2-3.2/0.29-11.2 T2-059
3-20	ZG-332905	SP PULL RETURN
3-21	EP-332383	⚠ SOLENOID W/TAP 1032PLT
	PLUNGER BLOCK	
3-22	EP-336718	⚠ SOLENOID W/TAP 0840PHT
3-23	BV-B332860	LEVER SOLENOID PART
3-24	ZG-328661	SP T2-3.2/0.29-25 T2-066
3-25x	EO-332352	COIL FIX 1 EL0606SK1 82.00μH K (L1, 2)
	FRONT WIRE BLOCK	
3-26	ES-319124	SW LEVER SCL101S 1-01-02N (SW901)
3-27	ES-332384	SW MICRO SS-5-F (SW 902)
3-28	ES-318284	SW LEVER SCL101R23A 1-01-02N (SW903, 904)
	ROTARY DETECTION (S) P.C BOARD BLOCK	
3-29	ED-332296	PHOTO SENSER GP-2L02 (PH1)
	ROTARY DETECTION (U) P.C BOARD BLOCK	
3-30	ED-332296	PHOTO SENSER GP-2L02 (PH1)
	HOLDER FLYWHEEL BLOCK	
3-31	VT-326476	HOLDER PIVOT
	MECHA FRAME BLOCK	
3-32	MV-322302	METAL LOADING
3-33	BM-337656	⚠ MOTOR VY220B14
3-34	MZ-B321701	HOLDER CAPSTAN PART
	ASSEMBLY BLOCK	
3-35	BL-B326453	LEVER TOGGLE SP (A) PART
3-36	ZG-328610	SP T2-6.3/0.8-28 T2-198
3-37	BL-B326455	LEVER TOGGLE SP (B) PART
3-38	ZG-313085	SP T1-6.3/0.8-25.0 T1-197
3-39	BL-B326464	LEVER ROLLING PART
3-40	BF-B332870	FLYWHEEL PART
3-41	MB-332872	BELT CAPSTAN

EJECTER BLOCK



4. EJECTER BLOCK

REF. NO.	PARTS NO.	DESCRIPTION
4-1	BV-327845	EJECTER ASSY

5. VIDEO P.C BOARD BLOCK

REF. NO.	PARTS NO.	DESCRIPTION
5-1	BA-V2004A290A	PC VIDEO (C) BLK VP-88EG
5-1	BA-V2004A290B	PC VIDEO (C) BLK VP-88EK (EK/EA)
5-1	BA-V2004A290C	PC VIDEO (C) BLK VP-88EGN

VIDEO (C) P.C BOARD

REF. NO.	PARTS NO.	DESCRIPTION
5-IC1	EI-332317	IC HA11741
5-IC2	EI-324203	IC AN6342N
5-TR1	ET-332314	TR 2SC536SP D, E, F, G,
5-TR2	ET-200412	TR 2SD636 Q,R S
5-TR3	ET-332311	TR 2SA608SP D, E, F, G,
5-TR4 ,5	ET-332314	TR 2SC536SP D, E, F, G,
5-TR7	ET-332314	TR 2SC536SP D, E, F, G,
5-TR8	ET-332314	TR 2SC536SP D, E, F, G, (EG/EGN)
5-TR9	ET-332314	TR 2SC536SP D, E, F, G, (EGN)
5-TR10	ET-332314	TR 2SC536SP D, E, F, G,
5-TR11	ET-332311	TR 2SA608SP D, E, F, G,
5-TR12	ET-337698	TR 2SA608SP F
5-TR13	ET-332314	TR 2SC536SP D, E, F, G, (EG/EGN)
5-TR14, 15	ET-332314	TR 2SC536SP D, E, F, G,
5-TR16	ET-332314	TR 2SC536SP D, E, F, G, (EG/EGN)
5-TR17	ET-332314	TR 2SC536SP D, E, F, G,
5-TR18	ET-332314	TR 2SC536SP D, E, F, G, (EGN)
5-TR19	ET-332314	TR 2SC536SP D, E, F, G,
5-TR20	ET-337697	TR 2SC536SP F
5-TR21 to 23	ET-332314	TR 2SC536SP D, E, F, G,
5-TR24	ET-332311	TR 2SA608SP D, E, F, G,
5-TR27 to 29	ET-332314	TR 2SC536SP D, E, F, G, (EGN)
5-TR30	ET-332311	TR 2SA608SP D, E, F, G, (EGN)
5-TR31	ET-332311	TR 2SA608SP D, E, F, G,
5-TR33, 34	ET-332314	TR 2SC536SP D, E, F, G
5-TR35	ET-200412	TR 2SD636 Q, R, S, (EGN)
5-TR37	ET-332310	TR 2SD638 P, Q, R
5-TR38	ET-332314	TR 2SC536SP D, E, F, G,
5-D1, 2	ED-344280	D SILICON H GMA-01-4
5-D3	ED-200468	D SILICON V DS448-VB6 (EGN)
5-D4 to 8	ED-344280	D SILICON H GMA-01-4
5-SW1	ES-338395	SW SLID HSW0690-200 2-02-03
5-VR1	EV-307620	R S-FIX H H0651A 3P 0.05W 222
5-VR2, 3	EV-307621	R S-FIX H H0651A 3P 0.05W 103
5-VC1, 2	EV-336802	C S-FIX H ECV-1ZW06×53T 2.0-8
5-FL1	ER-332347	FILTER LC LP ELB-5E017
5-FL2	ER-332344	FILTER LC BP ELB-5F029 4.43MHz
5-FL3	ER-332342	FILTER LC AP ELB-5F031 (EG/EGN)
5-FL4	ER-332345	FILTER LC BP ELB-5F030 5.06MHz
5-X1	EI-309878	OSC X'TAL 4.433619 MHz
5-X2	EI-322347	OSC X'TAL 4.435571 MHz
5-DL1	EI-332269	DL MS-18S-2
5-DL2	EI-332318	DL MS-15L-7 (EGN)
5-L1	EO-330245	COIL FIX 1 EL0606SK1 10μH K
5-L2 to 6	EO-330252	COIL FIX 1 EL0606SK1 100μH K
5-C43	EC-334009	C EC V F05 NP SM 330M 6.3DC

VIDEO (Y) P.C BOARD

REF. NO.	PARTS NO.	DESCRIPTION
5-IC1	EI-332266	IC HA11724
5-IC2	EI-332267	IC HA11725
5-TR1 to 3	ET-332310	TR 2SD638 P, Q, R
5-TR4	ET-337697	TR 2SC536SP F
5-TR5, 6	ET-337698	TR 2SA608SP F
5-TR7	ET-332311	TR 2SA608SP D, E, F, G
5-TR8, 9	ET-332314	TR 2SC536SP D, E, F, G
5-TR10, 11	ET-332301	TR 2SC1047 D, E
5-TR12	ET-332314	TR 2SC536SP D, E, F, G
5-TR13	ET-337697	TR 2SC536SP F
5-TR14	ET-337698	TR 2SA608SP F
5-TR15	ET-332312	TR 2SA608SP F,G
5-TR16 to 18	ET-332314	TR 2SC536SP D, E, F, G
5-TR21	ET-332311	TR 2SA608SP D, E, F, G
5-TR22 to 26	ET-332314	TR 2SC536SP D, E, F, G
5-TR27	ET-332311	TR 2SA608SP D, E, F, G
5-TR28	ET-337697	TR 2SC536SP F
5-D1	ED-344280	D SILICON H GMA-01-4
5-VC1	EC-338459	C S-FIX H ECV-1ZW25×53T 3.8-28
5-VR1	EV-307706	R S-FIX H H0651A 3P 0.05W 471
5-VR2	EV-307621	R S-FIX H H0651A 3P 0.05W 103
5-VR3, 4	EV-307620	R S-FIX H H0651A 3P 0.05W 222
5-VR5, 6	EV-307653	R S-FIX H H0651A 3P 0.05W 102
5-VR7	EV-332320	R S-FIX H H0651A 3P 0.05W 332
5-VR8	EV-332319	R S-FIX H H0651A 3P 0.05W 221
5-VR9	EV-307621	R S-FIX H H0651A 3P 0.05W 103
5-VR10	EV-307620	R S-FIX H H0651A 3P 0.05W 222
5-L1	EO-330252	COIL FIX 1 EL0606SK1 100μH K
5-L2	EO-574110	COIL FIX 1 FS0810S 47.00μH J
5-L3	EO-330242	COIL FIX 1 EL0606SK1 39μH K
5-L4	EO-330252	COIL FIX 1 EL0606SK1 100μH K
5-L5	EO-330248	COIL FIX 1 EL0606SK1 33μH K
5-L6	EO-330242	COIL FIX 1 EL0606SK1 39μH K
5-L7, 8	EO-330249	COIL FIX 1 EL0606SK1 8.2μH K
5-L9, 10	EO-330252	COIL FIX 1 EL0606SK1 100μH K
5-L11	EO-330248	COIL FIX 1 EL0606SK1 33μH K
5-L12	EO-330247	COIL FIX 1 EL0606SK1 27μH K
5-L13	EO-243977	COIL FIX 1 FL07H 1MH J
5-L14	EO-424866	COIL FIX 1 FL07H 1.20MH J
5-L15	EO-330252	COIL FIX 1 EL0606SK1 100μH K
5-L17	EO-330250	COIL FIX 1 EL0606SK1 22μH K
5-L18	EO-330252	COIL FIX 1 EL0606SK1 100μH K
5-L19	EO-330240	COIL FIX 1 EL0606SK1 47μH K
5-FL1	ER-336797	FILTER LC HP ELB-5F032
5-FL2	ER-332339	FILTER LC HP ELB-5D007
5-FL3	ER-332341	FILTER LC LP ELB-5G008
5-FL4	ER-332343	FILTER LC LP ZLB-5E272
5-FL5	ER-338167	FILTER LC LP ELB-5D008
5-DL1	EI-337969	DL EFD-YN645A13A
5-RC1	ER-337694	CR COMP EXR-P103P682S
5-R43	ER-338479	R MF H T26 1/8W 1301F
5-R45	ER-338480	R MF H T26 1/8W 1001F
5-R46	ER-338481	R MF H T26 1/8W 1501F
5-C2	EC-334009	C EC V F05 NP SM 330M 6.3DC
5-C66	EC-305445	C TT V D 1R0M 16.0DC

POWER & AUDIO P.C BOARD

REF. NO.	PARTS NO.	DESCRIPTION
5-IC1	EI-332285	IC HA13002
5-IC2	EI-332286	IC BA5102
5-TR1	ET-332332	TR 2SB772 P, Q, R
5-TR2, 3	ET-257253	TR 2SB605 K, L, M
5-TR4	ET-332313	TR 2SC536SP E, F, G
5-TR5, 6	ET-332313	TR 2SC536SP E, F, G
5-TR7, 8	ET-322778	TR 2SA608K-NP E, F, G
5-TR9	ET-338243	TR 2SA1069 K, L
5-TR10, 11	ET-328272	TR 2SC536K-NP F
5-TR12 to 16	ET-332313	TR 2SC536SP E, F, G
5-TR17	ET-332312	TR 2SA608SP F, G
5-TR18, 19	ET-332313	TR 2SC536SP E, F, G
5-TR20	ET-200741	TR 2SD571 K, L, M
5-TR21, 22	ET-332313	TR 2SC536SP E, F, G
5-D1 to 4	ED-332289	D SILICON ERA81-004 40/1.0A
5-D5	ED-224526	D SILICON 10D1 100 1.0A
5-D6 to 9	ED-344280	D SILICON H GMA-01-4
5-D10	ED-224526	D SILICON 10D1 100/1.0A
5-D11, 12	ED-344280	D SILICON H GMA-01-4
5-VR1	EV-337946	R S-FIX H TM64K3 3P 0.30W 501
5-VR2, 3	EV-337949	R S-FIX H TM64K3 3P 0.30W 103
5-VR4	EV-337945	R S-FIX H TM64K3 3P 0.30W 104
5-VR5	EV-337957	R S-FIX H TM64K3 3P 0.30W 102
5-VR6	EV-337949	R S-FIX H TM64K3 3P 0.30W 103
5-RL1, 2	EP-337185	RELAY SIG G2E 1TR 9V
5-L1 to 3	EO-332284	COIL FIX 2 0374-040 100μH
5-L4	EO-337186	COIL VARI 1 2325-349 970μH
5-L5	EO-332284	COIL FIX 2 0374-040 100μH
5-L6	EO-332288	COIL FIX 2 0379-028 800μH
5-L7, 8	EO-332284	COIL FIX 2 0374-040 100μH
5-L9	EO-301712	COIL FIX 1 RX9P-223J 22MH J
5-L10	EO-338001	COIL FIX 1 FL09H 12MH J

REF. NO.	PARTS NO.	DESCRIPTION
5-L11, 12	EO-301712	COIL FIX 1 RX9P-223J 22MH J
5-L13	EO-243977	COIL FIX 1 FL07H 1MH J
5-T1	EO-337187	COIL OSC 1 0312-077 70.0KC
5-R71	ER-322787	R CB H SNP FS RDS 1/4W 100J
5-C6	EC-322841	C PP V ECQ-F 472J 630DC

6. SERVO & SYS. CON. P.C BOARD BLOCK

REF. NO.	PARTS NO.	DESCRIPTION
6-1	BA-V2004A310A	PC SERVO SYSCON BLK VP-88EG (EG/EK/EA)
6-1	BA-V2004A310B	PC SERVO SYSCON BLK VP-88EGN

SERVO & SYS. CON. P.C BOARD

REF. NO.	PARTS NO.	DESCRIPTION
6-IC1	EI-332259	IC TC4052BP
6-IC2	EI-332257	IC NJM555
6-IC3	EI-326044	IC AN6350
6-IC4	EI-213390	IC NJM4558D
6-IC5	EI-332254	IC HA11714
6-IC6	EI-332255	IC HA11715
6-IC7	EI-328598	IC DN850
6-IC8	EI-325992	IC HD14024BP
6-IC9	EI-332259	IC TC4052BP
6-IC10	EI-321604	IC AN6341N
6-IC11	EI-328593	IC HD14053BP
6-IC12	EI-336787	IC AN6564
6-IC14	EI-313797	IC TC4001BP
6-IC15	EI-304657	IC TC4011BP
6-IC16	EI-332287	IC M54517P
6-IC50	EI-332260	IC MB8851M-231L
6-IC51	EI-324203	IC AN6342N (EGN)
6-IC52, 53	EI-332287	IC M54517P
6-TR1 to 7	ET-200412	TR 2SD636 Q, R, S
6-TR8	ET-200412	TR 2SD636 Q, R, S (EGN)
6-TR9, 10	ET-200412	TR 2SD636 Q, R, S
6-TR11	ET-200415	TR 2SB641 Q, R, S
6-TR13 to 15	ET-200412	TR 2SD636 Q, R, S
6-TR16	ET-200415	TR 2SB641 Q, R, S
6-TR17, 18	ET-200412	TR 2SD636 Q, R, S
6-TR19	ET-200741	TR 2SD571 K, L, M
6-TR20	ET-200415	TR 2SB641 Q, R, S
6-TR22	ET-338424	TR 2SB941 Q, R, S
6-TR23	ET-200412	TR 2SD636 Q, R, S
6-TR51 to 53	ET-200412	TR 2SD636 Q, R, S
6-TR54, 55	ET-257253	TR 2SB605 K, L, M
6-TR56 to 59	ET-200412	TR 2SD636 Q, R, S
6-TR60	ET-337747	TR 2SD879
6-TR61	ET-200412	TR 2SD636 Q, R, S
6-TR62	ET-332411	TR 2SD1164 K, L, M
6-TR63	ET-337332	TR 2SD992 K, L, M
6-TR64	ET-200412	TR 2SD636 Q, R, S
6-TR66	ET-332411	TR 2SD1164 K, L, M
6-TR67	ET-337747	TR 2SD879
6-TR69	ET-332411	TR 2SD1164 K, L, M
6-TR70	ET-200415	TR 2SB641 Q, R, S
6-TR71	ET-332349	TR 2SD826 E, F, G
6-TR72	ET-332422	TR 2SB774 Q, R, S
6-TR73	ET-200415	TR 2SB641 Q, R, S
6-TR74	ET-200412	TR 2SD636 Q, R, S
6-TR75	ET-200415	TR 2SB641 Q, R, S
6-TR76	ET-337182	TR 2SC1061 B, C, D
6-TR78	ET-200412	TR 2SD636 Q, R, S
6-TR79	ET-200415	TR 2SB641 Q, R, S
6-TR80	ET-200412	TR 2SD636 Q, R, S
6-TR85	ET-200415	TR 2SB641 Q, R, S
6-D1 to 11	ED-344280	D SILICON H GMA-01-4
6-D12	ED-309437	D SILICON H 1S1926-M
6-D13 to 20	ED-344280	E SILICON H GMA-01-4
6-D22	ED-344280	D SILICON H GMA-01-4
6-D24 to 28	ED-344280	D SILICON H GMA-01-4
6-D30	ED-344280	D SILICON H GMA-01-4
6-D31	ED-318988	D LED SR505D RED (EGN)
6-D32 to 35	ED-344280	D SILICON H GMA-01-4
6-D50 to 52	ED-344280	D SILICON H GMA-01-4
6-D101	ED-555895	D ZENER H WZ-065
6-D103 to 108	ED-344280	D SILICON H GMA-01-4
6-D110 to 114	ED-322299	D SILICON 10D1FA-2 F12 100/1.0A
6-D116	ED-344280	D SILICON H GMA-01-4
6-D117, 118	ED-322299	D SILICON 10D1FA-2 F12 100/1.0A
6-D120	ED-344280	D SILICON H GMA-01-4
6-D122 to 124	ED-344280	D SILICON H GMA-01-4
6-D125	ED-315367	D ZENER H WZ-050
6-D126 to 128	ED-344280	D SILICON H GMA-01-4
6-D129	ED-338587	D ZENER H XZ-100
6-D132	ED-338586	D ZENER H XZ-070
6-D133 to 135	ED-344280	D SILICON H GMA-01-4
6-J1	EJ-336799	PLUG CONNECTOR W-P9809 9P
6-J2	EJ-336800	PLUG CONNECTOR W-P9815 15P
6-VR2	EV-337953	R S-FIX H TM64K3 3P 0.30W 503
6-VR3	EV-337952	R S-FIX H TM64K3 3P 0.30W 105
6-VR4, 5	EV-337953	R S-FIX H TM64K3 3P 0.30W 503
6-VR6	EV-341228	R S-FIX H KVSF807V 3P 105
6-VR7	EV-337953	R S-FIX H TM64K3 3P 0.30W 503
6-VR8	EV-337951	R S-FIX H TM64K3 3P 0.30W 303
6-VR9	EV-337953	R S-FIX H TM64K3 3P 0.30W 503 (EGN)
6-VR10	EV-337950	R S-FIX H TM64K3 3P 0.30W 683
6-VR13, 14	EV-337951	R S-FIX H TM64K3 3P 0.30W 303
6-VR16	EV-337949	R S-FIX H TM64K3 3P 0.30W 103
6-VR17	EV-337948	R S-FIX H TM64K3 3P 0.30W 203 (EGN)
6-VR18	EV-337953	R S-FIX H TM64K3 3P 0.30W 503
6-VR21	EV-337947	R S-FIX H TM64K3 3P 0.30W 504
6-VR22	EV-337952	R S-FIX H TM64K3 3P 0.30W 105
6-VR23	EV-332253	VR ROTARY 16P10×1H B104
6-VR24	EV-332327	VR ROTARY 16P10×1G B504

REF. NO.	PARTS NO.	DESCRIPTION
5-VR25	EV-337181	VR ROTARY 16P10×1F B203
6-VR26	EV-337949	R S-FIX H TM64K3 3P 0.30W 103
6-RL1	EP-337885	RELAY SIG FBR211AD012-P 1TR 12V
6-RL2, 3	EP-337886	RELAY SIG FBR221D009 2TR 9V
6-L5	EO-312097	COIL FIX 1 FL05H 10μH K
6-L6	EO-338112	COIL FIX 1 LAL04 10μH K
6-L7	EO-330252	COIL FIX 1 EL0606SK1 100μH K
6-L8	EO-304737	COIL FIX 1 FL07H 330μH M
6-X1	EC-332293	OSC CE EFO-A01 3.58MHz
6-TH1	ET-338414	POSISTER PTH61G11BD2R2N
6-RC1	ER-337334	R COMP EXB-EQ7472M
6-RC2	ER-332250	R COMP EXB-P87472K
6-RC3	ER-338361	R COMP EXB-P810472K
6-R8	ER-336972	R MF H F05 1/8W 1303F
6-R9	ER-340546	R MF H F05 1/8W 1802F
6-R13	ER-340543	R MF H F05 1/8W 2703F
6-R14	ER-340544	R MF H F05 1/8W 1002F
6-R15	ER-340545	R MF H F05 1/8W 2701F
6-R40	ER-337338	R MF H F05 1/8W 6202F
6-R46	ER-336752	R MF H F05 1/8W 1202F
6-R47	ER-340548	R MF H F05 1/8W 1083F
6-R76	ER-336756	R OMF H FS 1W R47J
6-R85	ER-340543	R MF H F05 1/8W 2703F
6-R110	ER-337335	R MF H F05 1/8W 9102F
6-R111	ER-340545	R MF H F05 1/8W 2701F
6-R112	ER-338213	R MF H T26 1/8W 2202F
6-R113	ER-337336	R MF H F05 1/8W 3302F
6-R114	ER-200377	R MF H F05 1/8W 8202F
6-R115	ER-337338	R MF H F05 1/8W 6202F
6-R334	ER-336744	R OMF H FS 1W 560J
6-R335	ER-336745	R OMF H FS 1W 270J
6-C4	EC-309115	C COMP V AWS 104J 50DC
6-C79	EC-342947	C PP V ECQ-P 162J 100DC
6-BT1	AX-332302	BATTERY

DISPLAY P.C BOARD

REF. NO.	PARTS NO.	DESCRIPTION
6-IC1, 2	EI-319496	IC MC14539BCP
6-IC3	EI-332279	IC TMS1100/M34026
6-IC4	EI-332281	IC MC14077
6-IC5	EI-332282	IC LM2901
6-TR1, 2	ET-309434	TR 2SD636 Q, R, S, T
6-TR3	ET-200415	TR 2SB641 Q, R, S
6-TR4	ET-309434	TR 2SD636 Q, R, S, T
6-TR5, 6	ET-200415	TR 2SB641 Q, R, S
6-TR7 to 11	ET-309434	TR 2SD636 Q, R, S, T
6-TR12	ET-200415	TR 2SB641 Q, R, S
6-D1 to 4	ED-344280	D SILICON H GMA-01-4
6-D5	ED-338586	D ZENER H XZ-070
6-D6	ED-322809	D ZENER H WZ-081
6-D7 to 11	ED-344280	D SILICON H GMA-01-4
6-D12 to 16	ED-318988	D LED SR505D RED
6-D17	ED-332283	D LED SG205D GRN
6-D18	ED-318988	D LED SR505D RED
6-D19 to 22	ED-344280	D SILICON H GMA-01-4
6-J1	EJ-336798	SOCKET JUMPER W-D2509 9P
6-J2	EJ-336747	SOCKET JUMPER W-D2512 15P
6-SW1 to 17	ES-332277	SW TACT EVQ-QJ104K
6-SW18	ES-338405	SW SLIDE HSW0669-010 2-02-03W (EGN)
6-1N1	EM-332350	IND FL AM806
6-R52	ER-340544	R MF H F05 1/8W 1002F
6-R53	ER-200377	R MF H F05 1/8W 8202F
6-R54	ER-337339	R MF H F05 1/8W 3902F
6-R55	ER-340546	R MF H F05 1/8W 1802F
6-R56	ER-340544	R MF H F05 1/8W 1002F
6-R59	ER-340544	R MF H F05 1/8W 1002F
6-R73	ER-200376	R MF H F05 1/8W 4702F
6-R77, 78	ER-340554	R MF H F05 1/8W 5602F

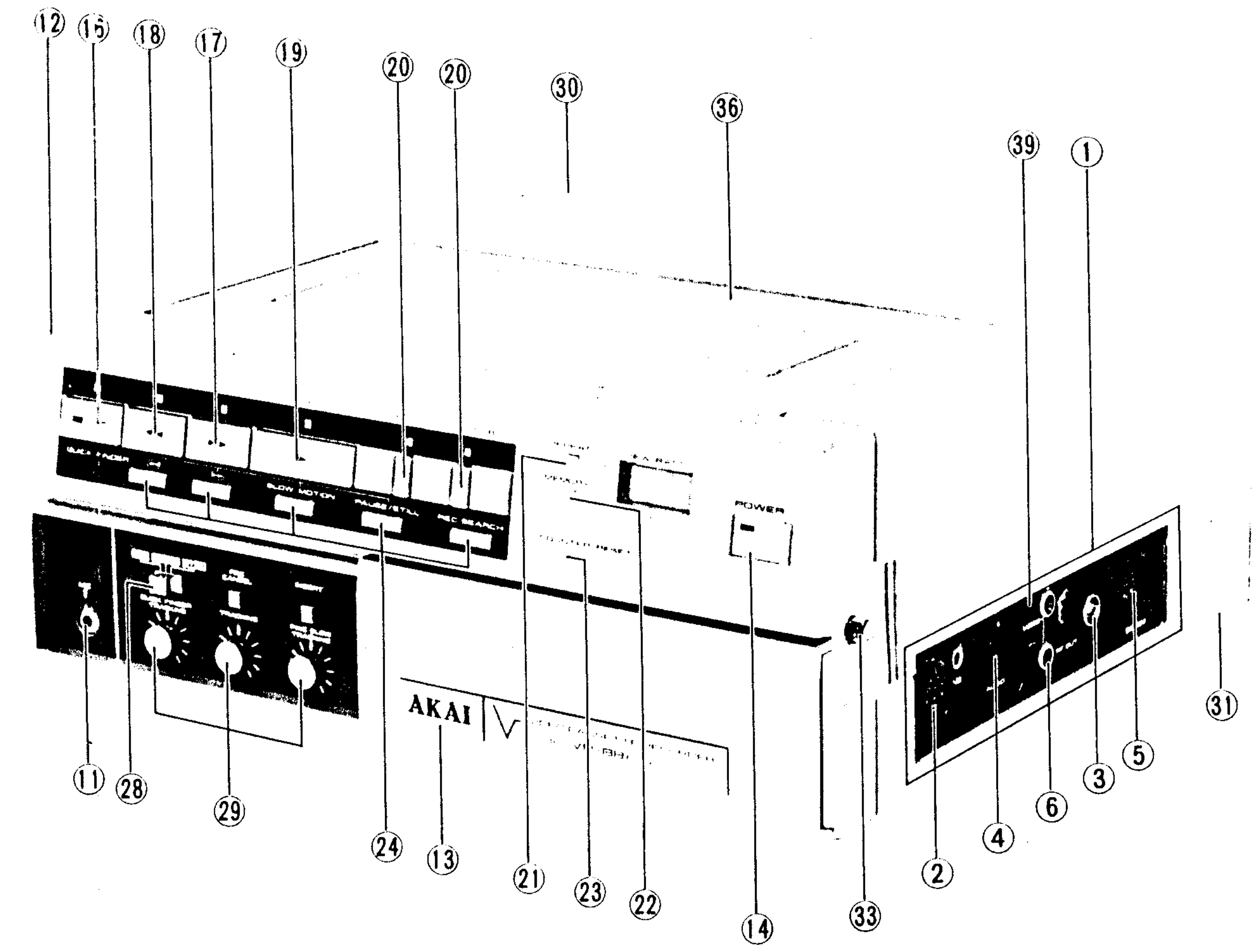
SUB SHUT OFF P.C BOARD

REF. NO.	PARTS NO.	DESCRIPTION
6-TR1, 2	ET-200415	TR 2SB641 Q, R, S
6-TR3 to 5	ET-309434	TR 2SD636 Q, R, S, T
6-D1	ED-338568	D ZENER H EZ-081
6-D2	ED-338569	D ZENER H RD-3.0E L

7. CAPSTAN MOTOR DRIVE P.C BOARD BLOCK

REF. NO.	PARTS NO.	DESCRIPTION
7-1	BA-V2004A040A	PC CM DRIVE BLK VP-88EG
7-TR1, 2	ET-322775	TR 2SC536K-NP E, F, G
7-TR3, 4	ET-325899	TR 2SC1983 R
7-TR5, 6	ET-339846	TR 2SB761 P, Q
7-D1, 2	ED-332270	D SILICON H 1SS133
7-D3, 4	ED-224526	D SILICON 10D1 100/1.0A
7-L1, 2	EO-310074	COIL FIX 1 FL04H 6.80μH K
7-C5	EC-657044	C EC V CUT NP 04D 1R0M 50DC

FINAL ASSEMBLY BLOCK



8. FINAL ASSEMBLY BLOCK

REF. NO.	PARTS NO.	DESCRIPTION
	SIDE CONNECTOR BLOCK	
8-1	BJ-V2004A150A	CASE SIDE CONNECTOR BLK VP-88EG
8-2	EJ-332377	PLUG 10P CONNECTOR RM215TRE-10SE 10P
8-3	EJ-780054	PLUG COAX HXC0228-01A
8-4	EJ-780055	SOCKET 5P W/SW TCS3554-10A
8-5	EJ-780056	SOCKET 4P TCS0145-10A
8-6	EJ-780057	PIN J W/SW HJW0001-01A
8-7x	BV-332303	RF CONVERTER MDK3-353 (EG/EGN)
8-7x	BV-332304	RF CONVERTER MBK3-353 (EK)
8-7x	BV-332305	RF CONVERTER MSK2-083 (EA)
8-8x	EW-332297	CORD PIN-PIN
8-9x	EJ-200618	⚠ SOCKET INLET HEC470-630 (J2)
8-10x	EF-306952	⚠ FUSE TSC A 250V 4A (F1)
	MIC JACK P.C BOARD BLOCK	
8-11	EJ-332295	PHONE J 2P HSJ0409-030 3.5 (J1)
	FRONT PANEL BLOCK	
8-12	BD-V2004A470A	PANEL FRONT BLK VP-88EG
8-12	BD-V2004A470B	PANEL FRONT BLK VP-88EK
8-12	BD-V2004A470C	PANEL FRONT BLK VP-88EA
8-12	BD-V2004A470D	PANEL FRONT BLK VP-88EGN
8-13	SM-336084A	NAME PLATE AKAI VP-88EG
8-13	SM-336084B	NAME PLATE AKAI VP-88EK
8-13	SM-336084C	NAME PLATE AKAI VP-88EA
8-13	SM-336084D	NAME PLATE AKAI VP-88EGN
8-14	SK-332950	KNOB POWER
8-15x	ZG-332953	SP PLATE SW
8-16	SK-332962A	KNOB (A)
8-17	SK-332962B	KNOB (B)
8-18	SK-332962C	KNOB (C)
8-19	SK-332962D	KNOB (D)
8-20	SK-332963	KNOB (E)
8-21	SK-332964A	KNOB (F)
8-22	SK-332964B	KNOB (G)
8-23	SK-332964C	KNOB (H)
8-24	SK-332965	KNOB (I)
8-25x	ZG-332966	SP PLATE KNOB
8-26x	ZG-332967	SP HOLDER
8-27x	ZG-336377	SP PLATE EARTH
8-28	SK-332957	KNOB SLIDE (EGN)
	FINAL ASSEMBLY BLOCK	
8-29	SK-332959	KNOB TRACKING
8-30	EB-B332943	CASE UPPER PART
8-31	BD-B332944×1	CASE LOWER PART (EG/EK/EGN)
8-31	BD-B332944×2	CASE LOWER PART (EA)
8-32x	SA-341975	FOOT RUBBER
8-33x	VT-336539	MASK V-LOCK
8-34x	ZS-332970	SCREW BAND
8-35x	VT-332947	COVER BATTERY
8-36	BD-327698A	LID CASSETTE (ENGLISH)
8-37x	EW-321758	CORD VY-15 ANTENNA CABLE
8-38x	AX-332994	BAND
8-39	SM-780058	JACK NAME PLATE (A)

II. MODEL VA-88EG/EK

RECOMMENDED SPARE PARTS

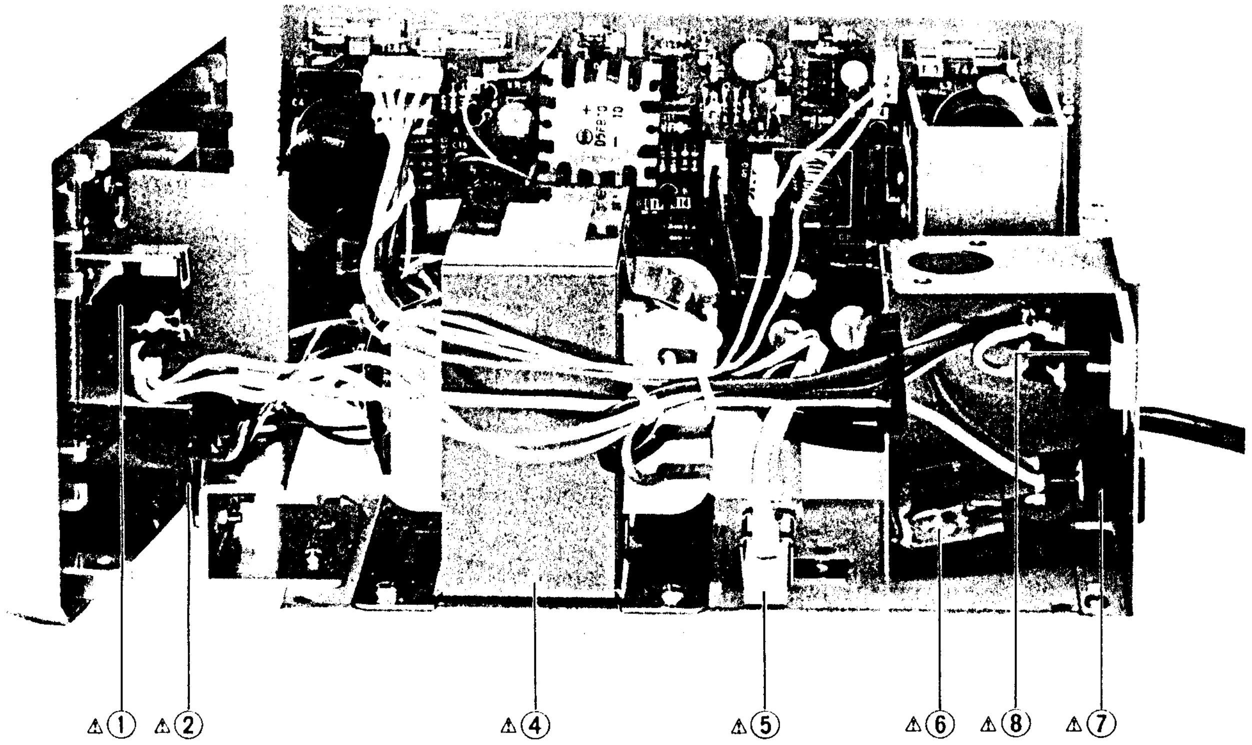
Because, if the parts listed below are on hand, almost any repair can be accomplished, we suggest that you stock these Recommended Spare Parts Items.

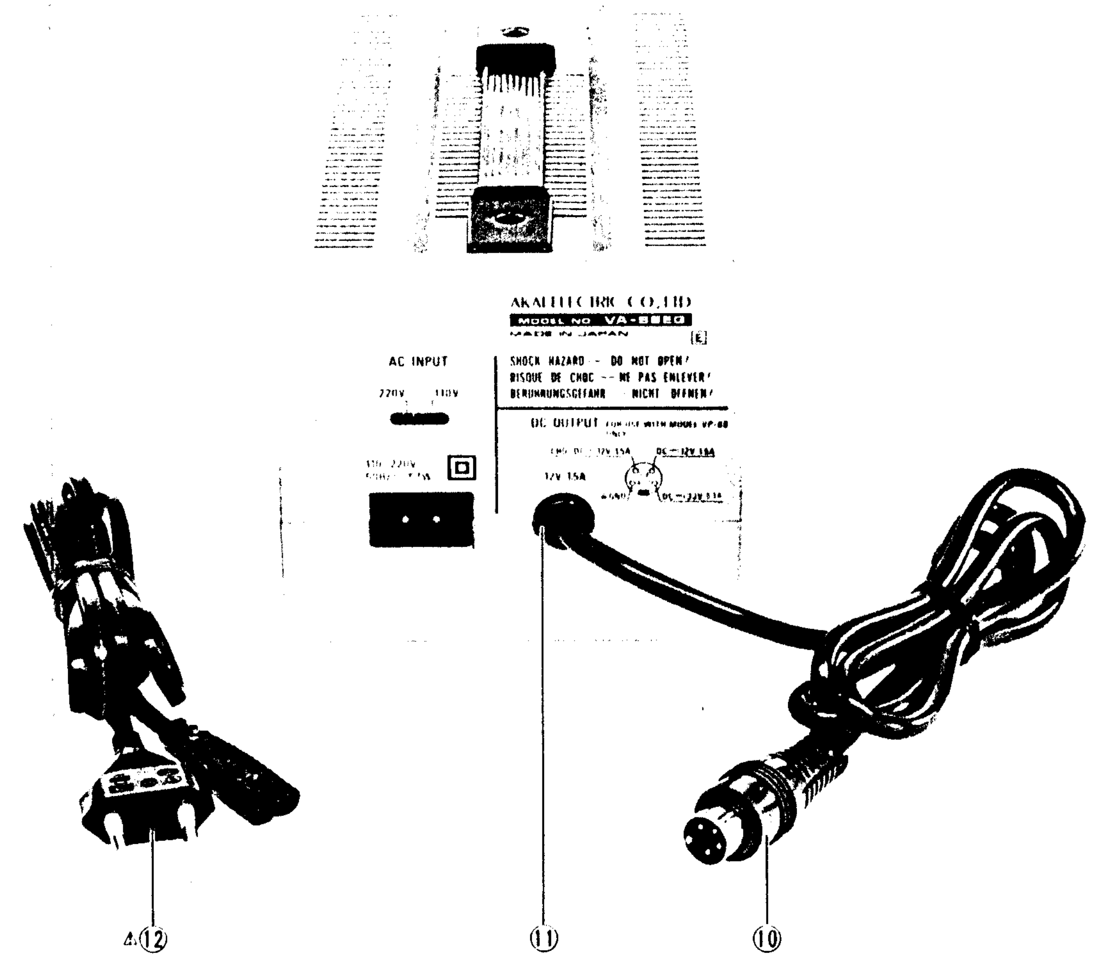
REF. NO.	PARTS NO.	DESCRIPTION
1	BT-710016	⚠ TRANS POWER VAT-88 VA-88EG/S
2	BT-710017	⚠ TRANS POWER VAT-88 VA-88EK
3	ED-704242	D LED TLR113A RED
4	ED-742518	D SILICON D5FB10
5	ED-604541	D SILICON H 1S2076
6	ED-742523	D SILICON RU-2
7	ED-704209	D SILICON SR3AM-2B
8	ED-705468	D SILICON T1B4B41
9	ED-742601	D THYRISTOR CR02AM-2
10	ED-710002	D THYRISTOR CR3CM-1
11	ED-331667	D ZENER H HZ7 A1
12	EF-742606	⚠ FUSE T 250V 1.0A
13	EF-742602	⚠ FUSE T 250V 1.6A
14	EF-742603	⚠ FUSE T 250V 4.0A
15	EI-742508	IC AN6780
16	EI-326159	IC LM2903P
17	EI-213827	IC UPC305C
18	EP-704284	RELAY G2U-113P-E
19	ER-701259	⚠ R FUSE SB 1/4W 100J
20	ER-702565	⚠ R FUSE 1/4 470J
21	ER-742677	FILTER FKOB160MH24
22	ES-742591	⚠ SW PUSH SDL1P2085
23	ES-705534	⚠ SW SLIDE TKR-22293
24	ET-307997	TR 2SA1115 D, E
25	ET-306705	TR 2SC1815 O, Y
26	ET-742515	TR 2SC2373 K, L
27	ET-742509	TR 2SD635
28	EV-704266	R S-FIX SR19R 222

1. POWER SUPPLY P.C BOARD BLOCK

REF. NO.	PARTS NO.	DESCRIPTION
1-1	BA-742589	PC POWER BLK VA-88
	POWER SUPPLY P.C BOARD	
1-IC1	EI-213827	IC UPC305C
1-IC2	EI-326159	IC LM2903P
1-IC3	EI-742508	IC AN6780
1-Q2	ET-306705	TR 2SC1815 O, Y
1-Q3	ET-742515	TR 2SC2373 K, L
1-Q4 ,5	ET-307997	TR 2SA1115 D, E
1-Q6 to 12	ET-306705	TR 2SC1815 O, Y
1-Q13, 14	ET-307997	TR 2SA1115 D, E
1-Q16	ET-306705	TR 2SC1815 O, Y
1-Q17	ET-307997	TR 2SA1115 D, E
1-Q18	ET-306705	TR 2SC1815 O, Y
1-Q19	ET-307997	TR 2SA1115 D, E
1-D1	ED-705468	D SILICON T1B4B41
1-D2, 3	ED-742518	D SILICON D5FB10
1-D4	ED-331667	D ZENER H HZ7 A1
1-D5	ED-604541	D SILICON H 1S2076
1-D6	ED-742523	D SILICON RU-2
1-D7 to 22	ED-604541	D SILICON H 1S2076
1-D23	ED-704209	D SILICON SR3AM-2B
1-D26 to 28	ED-604541	D SILICON H 1S2076
1-D30 to 33	ED-604541	D SILICON H 1S2076
1-D34	ED-307236	D ZENER H HZ22 1
1-D35	ED-604541	D SILICON H 1S2076
1-SR2	ED-742601	⚠ D THYRISTOR CR02AM-2
1-VR1, 2	EV-704266	R S-FIX SR19R 222
1-RY1	EP-704284	RELAY G2U-113P-E
1-L1	EO-742582	COIL OSC 125μH
1-L3	ER-742677	FILTER FK0B160MH24
1-F2	EF-742602	⚠ FUSE T 250V 1.6A
1-F3, 4	EF-742603	⚠ FUSE T 250V 4.0A
1-R1	ER-742537	⚠ R MF MSF 1W 1R0J
1-R4	ER-702565	⚠ R FUSE 1/4 470J
1-R6	ER-701259	⚠ R FUSE SB 1/4W 100J
1-R10	ER-742539	⚠ R CT 2W R10C
1-R14	ER-742540	⚠ R MF 3W 331J
1-R61	ER-708861	⚠ R MF MOR 2W 102J
1-C4	EC-340104	C EC V SNP NM 222 50DC
1-C8	EC-325109	C EC V CUT SM 102M 50DC
1-C9	EC-742552	C MY V AMZ 104K 50DC
1-C10	EC-321096	C EC V CUT SM 471M 16DC
1-C11	EC-316187	C EC V CUT SM 102M 16DC
1-C16	EC-333996	C EC V F05 NP SM 220M 16DC
1-C18	EC-333996	C EC V F05 NP SM 220M 16DC
1-C19	EC-742552	C MY V AMZ 104K 50DC
1-C22	EC-708865	C TT 2R2M 16DC
1-Q1	ET-742509	TR 2SD635
1-SR1	ED-710002	⚠ D THYRISTOR CR3CM-1
1-LED1	ED-704242	D LED TLR113A RED
1-LED2	ED-704242	D LED TLR113A RED

CHASSIS BLOCK

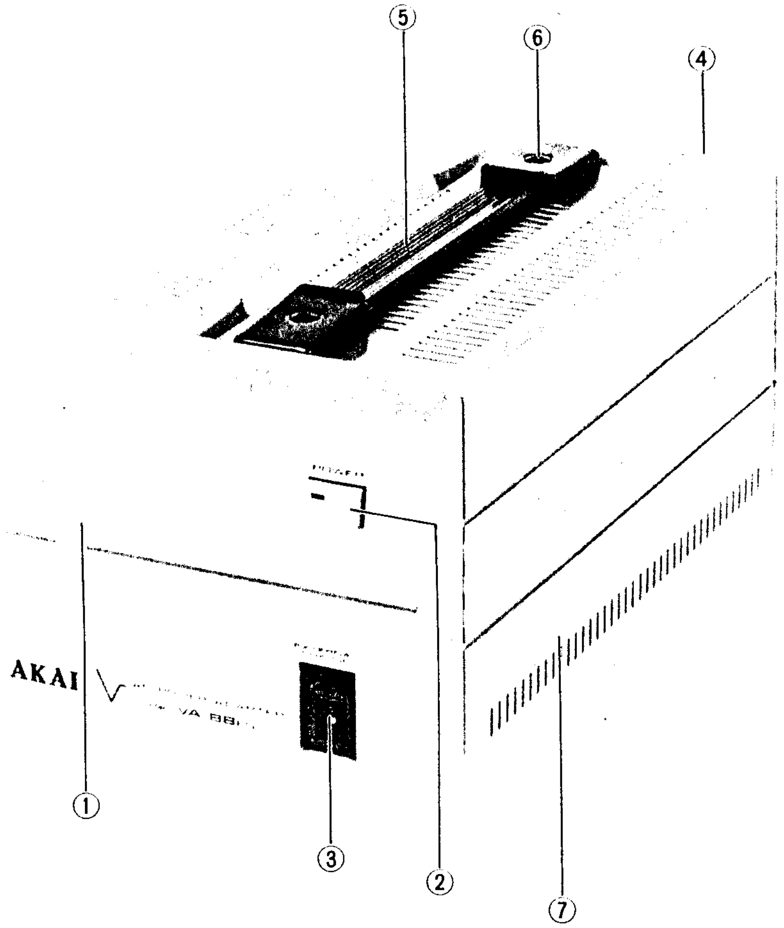



AKAI ELECTRIC CO.,LTD
MODEL NO VA-88EG
MADE IN JAPAN
AC INPUT
220V
110V
SHOCK HAZARD -- DO NOT OPEN!
RISQUE DE CHOC -- NE PAS ENLEVER!
BERUHRUNGSGEFAHR -- NICHT OFFNEN!
DC OUTPUT
12V 15A
⚠⑫
⑪
⑩

2. CHASSIS BLOCK

REF. NO.	PARTS NO.	DESCRIPTION
2-1	ES-742591	⚠ SW PUSH SDL1P2085 (SW902)
2-2	ET-742509	TR 2SD635 (Q1)
2-3x	ED-710002	⚠ D THYRISTOR CR3CM-1 (SR1)
2-4	BT-710016	⚠ TRANS POWER VAT-88 VA-88EG/S
2-4	BT-710017	⚠ TRANS POWER VAT-88 VA-88EK
2-5	ER-742560	⚠ R CT 10W 1R0J (R16)
2-6	EC-708739	⚠ C MP 473M 250DC (C901)
2-7	EJ-742516	⚠ SOCKET 2P INLET S-I6453
2-8	ES-705534	⚠ SW SLIDE TKR-22293 (SW901)
2-9x	EF-742606	⚠ FUSE T 250V 1.0A (F901)(EK)
2-10	EW-742522	DC CORD R-457B
2-11	EZ-742517	STRAIN RELIEF SR-5N-4
2-12	EW-315767	⚠ AC CORD 2 CORES KP-419C/KS-15 E (EG)
2-12	EW-322400	⚠ AC CORD 2 CORES GTBS-2F/KS-15 B (EK)

FINAL ASSEMBLY BLOCK



3. FINAL ASSEMBLY BLOCK

REF. NO.	PARTS NO.	DESCRIPTION
3-1	BD-742590	PANEL FRONT BLK VA-88EG
3-1	BD-742592	PANEL FRONT BLK VA-88EK
3-2	SK-710013	KNOB ASSY
3-3	EJ-704274	⚠ J S-G9220
3-4	SP-710012	COVER UPPER VA-88EG
3-4	SP-708859	COVER UPPER VA-88EK
3-5	VT-708860	HANDLE VA-88
3-6	ZS-462161	OCS40×20STL BN1
3-7	SP-710014	COVER LOWER VA-88

III. MODEL VU-88EG/EK/EA/EO

RECOMMENDED SPARE PARTS

Because, if the parts listed below are on hand, almost any repair can be accomplished, we suggest that you stock these Recommended Spare Parts Items.

REF. NO.	PARTS NO.	DESCRIPTION
1	AX-742610	BATTERY P-01-L2P3
2	BT-742679	⚠ TRANS POWER VUT-8KG (EG/EO)
3	BT-742680	⚠ TRANS POWER VUT-8KK (EK)
4	BT-742681	⚠ TRANS POWER VUT-8KS (EA)
5	BV-330111	ANT BOOSTER YBC1-001 (EG/EK)
6	BV-332107	ANT BOOSTER YBC1-003 (EO)
7	ED-704242	D LED TLR113A RED
8	ED-330238	D PHOTO PH302
9	ED-742518	D SILICON D5FB10
10	ED-604541	D SILICON H 1S2076
11	ED-742519	D SILICON H 1S2076A
12	ED-704267	D SILICON H 10E-1
13	ED-704209	D SILICON SR3AM-2B
14	ED-705468	D SILICON T1B4B41
15	ED-742601	D THYRISTOR CR02AM-2
16	ED-710002	D THYRISTOR CR3CM-1
17	ED-742520	D VARACTOR 1SV70-09
18	ED-324013	D ZENER H HZ20 2
19	ED-742521	D ZENER H HZ30 3
20	ED-329058	D ZENER H HZ5 C1
21	ED-331667	D ZENER H HZ7 A1
22	ED-705470	D ZENER HZ11C1
23	EE-332368	TV TUNER ENV-57753F2 VU-88EO (EO)
24	EE-332369	TV TUNER ENV-77731F2 VU-88EA (EA)
25	EE-332365	TV TUNER ENV-77753F2 (VU-88EG)
26	EE-332366	TV TUNER ENV-87516F2 (VU-88EK)
27	EF-742605	⚠ FUSE T 250V 0.2A
28	EF-742606	⚠ FUSE T 250V 1.0A (EK/EA)
29	EF-742602	⚠ FUSE T 250V 1.6A
30	EF-742603	⚠ FUSE T 250V 4.0A
31	EI-742508	IC AN6780
32	EI-326159	IC LM2903P
33	EI-324000	IC MB8841 463M
34	EI-337301	IC MB8843M-658M
35	EI-317895	IC MC14011BCP
36	EI-330475	IC M51510P
37	EI-704201	IC M5144P
38	EI-705494	IC TA7607P
39	EI-304657	IC TC4011BP
40	EI-330391	IC TC4050BP
41	EI-310036	IC TC4066BP
42	EI-306726	IC TC4069UBP
43	EI-324255	IC TL082CP
44	EI-742502	IC UPA80C
45	EI-330226	IC UPC1373H
46	EI-308473	IC UPC141C
47	EI-301748	IC UPC1458C
48	EI-742501	IC UPC624C
49	EM-318923	IND FL FIP12AM11 CHARACTER
50	ER-742600	FILTER CE CSA4MMT 4MHz
51	ER-742624	FILTER CE SFE 5.5MB (EG)
52	ER-742625	FILTER CE SFE 6.0MB (EK)
53	ER-742662	FILTER SAW SAF38.9MZ51Z (EG/EO)
54	ER-742663	FILTER SAW SAF39.5MZ51Z (EK)
55	ER-742639	R FUSE 1/4W 100J
56	ER-742498	R FUSE 1/4W 101J
57	ER-742497	R FUSE 1/4W 220J
58	ER-742526	R MF RNL 1/4W 272
59	ES-742618	⚠ SW ANT 00220501 (EA)
60	ES-705533	⚠ SW SEESAW SDE3S2023
61	ES-705534	⚠ SW SLIDE TKR-22293
62	ES-330414	SW ANT YBC1-012
63	ES-702617	SW EVQ-QJ104K
64	ES-742504	SW SLIDE SSMC1200
65	ET-332226	TR FET 2SK163 K, L, M
66	ET-325501	TR 2SA1015 O, Y
67	ET-307997	TR 2SA1115 D, E

REF. NO.	PARTS NO.	DESCRIPTION
68	ET-742514	TR 2SA490
69	ET-742512	TR 2SA675
70	ET-742510	TR 2SA950 O, Y
71	ET-666415	TR 2SB605 K, L
72	ET-495415	TR 2SC1211 D
73	ET-511694	TR 2SC1211 D, E
74	ET-306705	TR 2SC1815 O, Y
75	ET-742513	TR 2SC2383
76	ET-330464	TR 2SC2603 D, E
77	ET-200505	TR 2SC2603 E, F
78	ET-742646	TR 2SC388A
79	ET-742509	TR 2SD635
80	ET-330448	TR 2SD882
81	EV-742542	R S-FIX H TM8K 102
82	EV-742541	R S-FIX H TM8K 502
83	EV-742543	R S-FIX H0811A006 203
84	EV-704266	R S-FIX SR19R 222
85	EV-702567	R S-FIX TT24R 202
86	EV-702568	R S-FIX TT24R 502

1. POWER SUPPLY P.C BOARD BLOCK

REF. NO.	PARTS NO.	DESCRIPTION
1-1	BA-742583	PC POWER BLK VU-88
1-IC401	EI-326159	IC LM2903P
1-IC402	EI-324255	IC TL082CP
1-IC403	EI-304657	IC TC4011BP
1-IC404	EI-330475	IC M5L510P
1-IC405	EI-742501	IC UPC624C
1-IC406	EI-324000	IC MB8841 463M
1-IC407	EI-308473	IC UPC141C
1-IC408	EI-326159	IC LM2903P
1-IC409	EI-742508	IC AN6780
1-Q401, 402	ET-306705	TR 2SC1815 O, Y
1-Q406, 407	ET-306705	TR 2SC1815 O, Y
1-Q408	ET-330448	TR 2SD882
1-Q409 to 411	ET-306705	TR 2SC1815 O, Y
1-Q412	ET-742510	TR 2SA950 O, Y
1-Q413, 414	ET-306705	TR 2SC1815 O, Y
1-Q415	ET-742514	TR 2SA490
1-Q416 to 418	ET-325501	TR 2SA1015 O, Y
1-Q419	ET-306705	TR 2SC1815 O, Y
1-Q420	ET-325501	TR 2SA1015 O, Y
1-Q421 to 424	ET-306705	TR 2SC1815 O, Y
1-Q426	ET-306705	TR 2SC1815 O, Y
1-Q427, 428	ET-325501	TR 2SA1015 O, Y
1-Q429	ET-306705	TR 2SC1815 O, Y
1-D401	ED-604541	D SILICON H 1S2076
1-D402	ED-704267	D SILICON H 10E-1
1-D403 to 407	ED-604541	D SILICON H 1S2076
1-D408	ED-329058	D ZENER H HZ5 C1
1-D409, 410	ED-604541	D SILICON H 1S2076
1-D411	ED-705468	D SILICON T1B4B41
1-D412	ED-331667	D ZENER H HZ7 A1
1-D414	ED-742518	D SILICON D5FB10
1-D415 to 417	ED-604541	D SILICON H 1S2076
1-D418	ED-705468	D SILICON T1B4B41
1-D419 to 422	ED-704267	D SILICON H 10E-1
1-D424	ED-704209	D SILICON SR3AM-2B
1-D426, 427	ED-704209	D SILICON SR3AM-2B
1-D428 to 433	ED-604541	D SILICON H 1S2076
1-D435, 436	ED-604541	D SILICON H 1S2076
1-D438, 439	ED-604541	D SILICON H 1S2076
1-D441	ED-324013	D ZENER H HZ20 2
1-D422	ED-604541	D SILICON H 1S2076
1-D444 to 448	ED-604541	D SILICON H 1S2076
1-D449	ED-307236	D ZENER H HZ22 1
1-D450	ED-604541	D SILICON H 1S2076
1-SR402	ED-742601	⚠ D THYRISTOR CR02AM-2
1-CF401	ER-742600	FILTER CE CSA4MMT 4MHz
1-VR401	EV-742541	R S-FIX H TM8K 502
1-VR402	EV-742542	R S-FIX H TM8K 102
1-VR403	EV-704266	R S-FIX SR19R 222
1-R414	ER-742526	R MF RNL 1/4W 272
1-R422, 423	ER-742526	R MF RNL 1/4W 272
1-R428	ER-742537	⚠ R MF MSF 1W 1R0J
1-R430	ER-742527	⚠ R MF MOR 2W 102K
1-R432	ER-742500	⚠ R FUSE FMR 1/4W 391J
1-R443	ER-742528	R MF RL 1/4W 103
1-R444	ER-742529	R MF RNL 1/4W 143
1-R452	ER-742526	R MF RNL 1/4W 272
1-R453	ER-742530	R MF RNL 1/4W 512
1-R454	ER-742531	⚠ R MF MOR 1W 221J
1-R457	ER-742532	R MF RNL 1/4W 153
1-R458	ER-742533	R MF RNL 1/4W 243
1-R460	ER-742539	⚠ R CT 2W R10C
1-R469	ER-742534	⚠ R MF MOR 3W 331K
1-R506	ER-742536	R MF RNL 1/4W 463
1-C408	EC-300193	C EC V F05 NP SM 100M 16DC
1-C429	EC-334011	C EC V F05 NP SM 101M 6.3DC
1-C431	EC-340104	C EC V SNP NM 222 50DC
1-C434	EC-322358	C EC V SNP NM 103 35DC
1-C440	EC-321628	C EC V SNP NM 332 25.0DC
1-C441	EC-340130	C EC V SNP NM 103 16DC
1-C458	EC-333996	C EC V F05 NP SM 220M 16DC
1-C460	EC-708865	C TT 2R2M 16DC
1-F401	EF-742602	⚠ FUSE T 250V 1.6A
1-F402	EF-742603	⚠ FUSE T 250V 4.0A

REF. NO.	PARTS NO.	DESCRIPTION
1-F403	EF-742604	⚠ FUSE T 250V 2.0A
1-F404	EF-742603	⚠ FUSE T 250V 4.0A
1-F405	EF-742603	⚠ FUSE T 250V 4.0A
1-BT401	AX-742610	BATTERY P-01-L2P3

2. TUNER P.C BOARD BLOCK

REF. NO.	PARTS NO.	DESCRIPTION
2-1	BA-742584	PC TUNER BLK VU-88EG
2-1	BA-742586	PC TUNER BLK VU-88EK
2-1	BA-742587	PC TUNER BLK VU-88EA
2-1	BA-742585	PC TUNER BLK VU-88EO
2-2	EE-332365	TV TUNER ENV-77753F2 VU-88EG
2-2	EE-332366	TV TUNER ENV-87516F2 VU-88EK
2-2	EE-332369	TV TUNER ENV-77731F2 VU-88EA
2-2	EE-332368	TV TUNER ENV-57753F2 VU-88EO
2-IC101	EI-705494	IC TA7607P
2-IC102	EI-704201	IC M5144P
2-IC103	EI-306726	IC TC4069UBP
2-IC104	EI-317895	IC MC14011BCP
2-IC105	EI-301748	IC UPC1458C
2-IC106	EI-310036	IC TC4066BP
2-IC107	EI-306726	IC TC4069UBP
2-Q101	ET-742646	TR 2SC388A
2-Q102 to 104	ET-330464	TR 2SC2603 D, E
2-Q105	ET-511694	TR 2SC1211 D, E
2-Q106	ET-307997	TR 2SA1115 D, E
2-Q107	ET-200505	TR 2SC2603 E, F
2-Q108	ET-495415	TR 2SC1211 D
2-Q109 to 111	ET-330464	TR 2SC2603 D, E
2-Q112	ET-307997	TR 2SA1115 D, E
2-Q113 to 116	ET-330464	TR 2SC2603 D, E
2-Q117, 118	ET-742510	TR 2SA950 O, Y
2-Q119	ET-307997	TR 2SA1115 D, E
2-Q120	ET-330464	TR 2SC2603 D, E
2-Q121	ET-307997	TR 2SA1115 D, E
2-Q122	ET-511694	TR 2SC1211 D, E
2-Q123	ET-330464	TR 2SC2603 D, E
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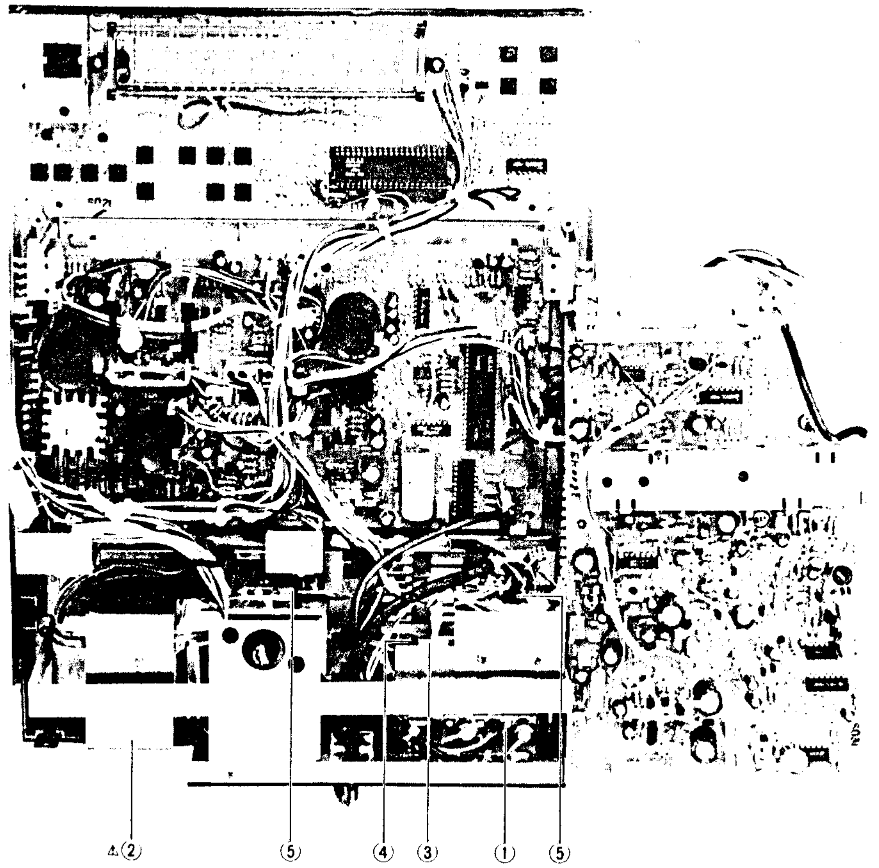
2-Q126	ET-742513	TR 2SC2383
2-Q127, 128	ET-330464	TR 2SC2603 D, E
2-Q132	ET-307997	TR 2SA1115 D, E
2-D101	ED-742520	D VARACTOR 1SV70-09
2-D103	ED-604541	D SILICON H 1S2076
2-D104	ED-604541	D SILICON H 1S2076 (EG/EA/EO)
2-D105 to 112	ED-604541	D SILICON H 1S2076
2-D113 to 116	ED-604541	D SILICON H 1S2076 (EG/EA/EO)
2-D117	ED-742521	D ZENER H HZ30 3 (EG/EA/EO)
2-D118 to 121	ED-604541	D SILICON H 1S2076
2-D122, 123	ED-704267	D SILICON H 10E-1
2-D124	ED-705470	D ZENER HZ11C1
2-D127	ED-604541	D SILICON H 1S2076
2-D130	ED-604541	D SILICON H 1S2076
2-VR101	EV-702568	R S-FIX TT24R 502
2-VR102	EV-702568	R S-FIX TT24R 502 (EG/EA/EO)
2-VR104, 105	EV-702567	R S-FIX TT24R 202
2-VR106	EV-702543	R S-FIX H0811A006 203
2-L102	EO-742653	COIL RF 144LY 2.0μH K (EG/EA/EO)
2-L102	EO-742571	COIL RF 144LY 2.2μH K (EK)
2-L103	EO-742655	COIL RF 6F16001A1 7K (EG/EA/EO)
2-L103	EO-742656	COIL RF 6F16001A2 7K (EA)
2-L106	EO-742658	COIL FIX I EPL 4.7μH K
2-L107	EO-701411	COIL RF SPL 15μH
2-L108	EO-705485	COIL FIX I 33μH K
2-L109	EO-701411	COIL RF SPL 15μH
2-L110	EO-742561	COIL SPL 100μH
2-L111	EO-701266	COIL PEAKING SPL-120 (EG/EA/EO)
2-L111	EO-742578	COIL SPL 10μH (EK)
2-L112	EO-742579	COIL SIF P327192 (EG/EA/EO)
2-L112	EO-742580	COIL SIF P327193 (EK)
2-L113	EO-742581	COIL OSC 2 CANS-4785LA
2-T102	EO-742574	COIL RF P320190
2-T103	EO-742575	COIL RF P320191 (EG/EK/EO)
2-T103	BT-742619	TRANS AFC BTKXNS (EA)
2-CF101	ER-742662	FILTER SAW SAF38.9MZ51Z (EG/EO)

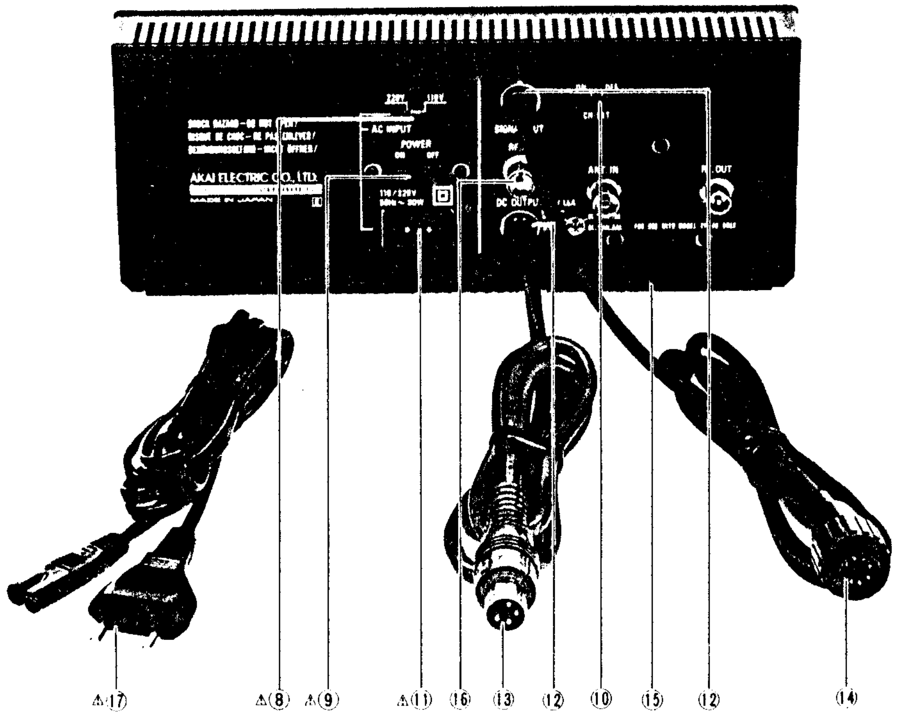
REF. NO.	PARTS NO.	DESCRIPTION
2-CF101	ER-742663	FILTER SAW SAF39.5MZ51Z (EK)
2-CF101	ER-742664	FILTER SAW SAF36.9MZ51Z (EA)
2-CF102	ER-742622	FILTER CE TPS 5.5MB (EG)
2-CF102	ER-742623	FILTER CE TPS 6.0MB (EK)
2-CF103	ER-742624	FILTER CE SFE 5.5MB (EG)
2-CF103	ER-742625	FILTER CE SFE 6.0MB (EK)
2-F101	EF-742605	⚠ FUSE T 250V 0.2A
2-R138	ER-742497	⚠ R FUSE 1/4W 220J
2-R166	ER-742497	⚠ R FUSE 1/4W 220J
2-R200	ER-708866	R MF RNL 1/4W 822
2-R203	ER-708867	R MF RNL 1/4W 433
2-R222	ER-742498	⚠ R FUSE 1/4W 101J
2-R290	ER-742639	⚠ R FUSE 1/4W 100J
2-C117	EC-742640	C TT R47M 35DC
2-C121	EC-334013	C EC V CUT NP SM 331M 6.3DC
2-C126	EC-326588	C EC V CUT SM 102M 10DC
2-C130	EC-742547	C MY V AMZ 822J 50DC
2-C138	EC-742643	C MY AMZ 273K 50V
2-C140, 141	EC-742544	C MY V AMZ 222K 50DC
2-C142	EC-742545	C MY V AMZ 333K 50DC
2-C143	EC-742546	C MY V AMZ 683K 50DC
2-C145	EC-705509	C PP CQ091H 333J 50DC
2-C146	EC-705511	C PP 683J 50DC
2-C147	EC-742551	C MY V AMZ 822K 50DC
2-C149	EC-742546	C MY V AMZ 683K 50DC
2-C150, 151	EC-200456	C MY V AMZ 102J 50DC

3. DISPLAY P.C BOARD BLOCK

REF. NO.	PARTS NO.	DESCRIPTION
3-1	BA-742612	PC DISPLAY BLK VU-88EG (EG EK EO)
3-1	BA-742613	PC DISPLAY BLK VU-88EA (EA)
3-IC301	EI-330226	IC UPC1373H
3-IC302	EI-337301	IC MB8843M-658M
3-IC303	EI-330391	IC TC4050BP
3-IC304 to 306	EI-742502	IC UPA80C
3-Q301	ET-332226	TR FET 2SK163 K, L, M
3-Q302	ET-325501	TR 2SA1015 O, Y
3-Q303 to 306	ET-306705	TR 2SC1815 O, Y
3-Q307	ET-666415	TR 2SB605 K, L
3-D301	ED-330238	D PHOTO PH302
3-D302	ED-704242	D LED TLR113A RED
3-D303 to 307	ED-604541	D SILICON H 1S2076
3-D308	ED-704242	D LED TLR113A RED
3-D309 to 323	ED-604541	D SILICON H 1S2076
3-D325	ED-704242	D LED TLR113A RED
3-D326	ED-742519	D SILICON H 1S2076A
3-D327	ED-704242	D LED TLR113A RED
3-DG301	EM-318923	IND FL FIP12AM11 CHARACTER
3-L301	EO-742611	COIL 126LNS-6285Z
3-CF301	ER-742600	FILTER CE CSA4MMT 4MHz
3-SW301 to 315	ES-742617	SW EVQ-QJ104K
3-SW16	ES-742618	SW ANT 00220501 (EA)
3-C303	EC-742549	C MY V AMZ 472K 50DC
3-C306	EC-742545	C MY V AMZ 333K 50DC
3-2	ER-742616	FILTER IR-90

ASSEMBLY BLOCK

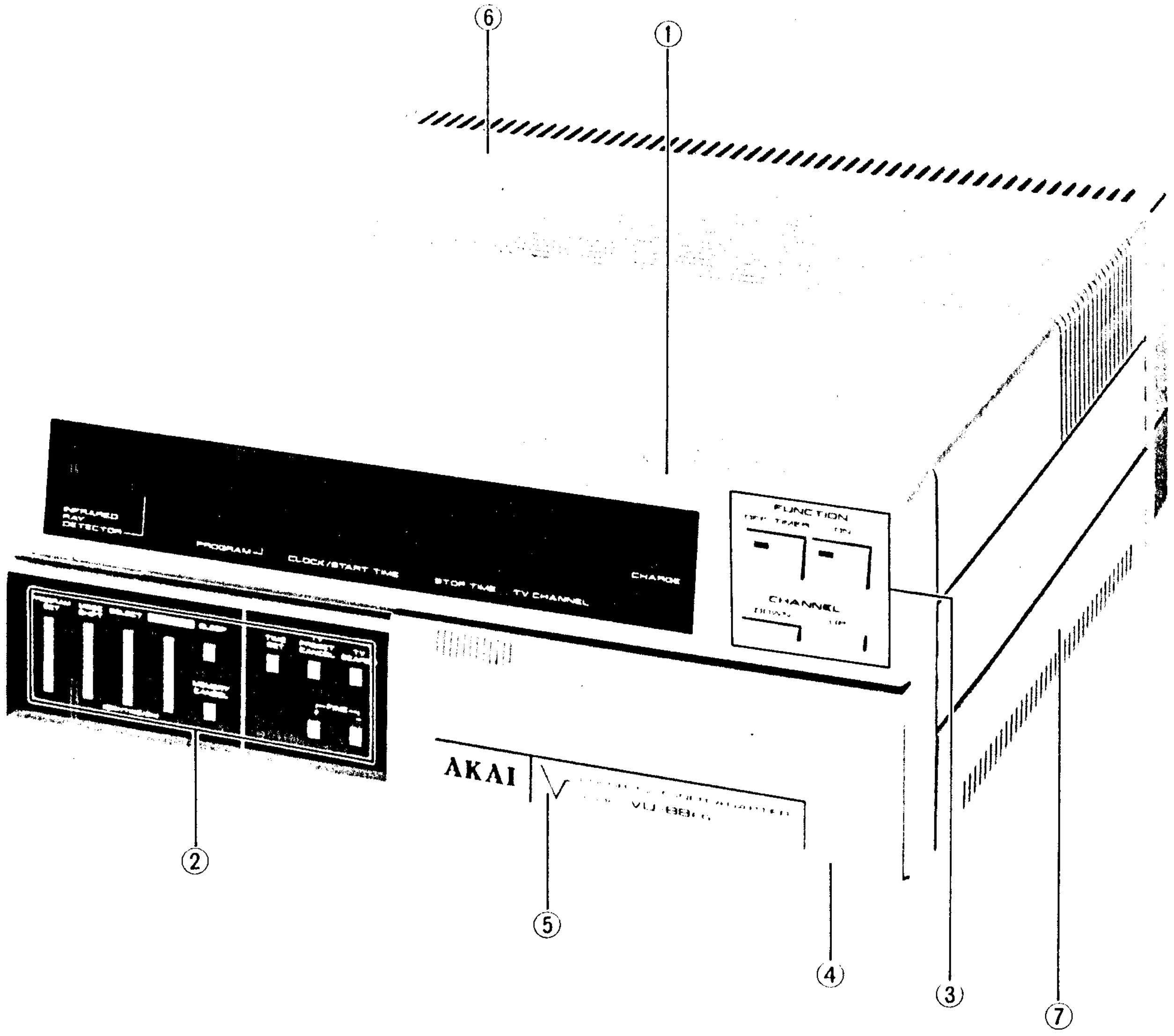




4. ASSEMBLY BLOCK

REF. NO.	PARTS NO.	DESCRIPTION
4-1	BV-330111	ANT BOOSTER YBC1-001 (EG/EK)
4-1	ES-330414	⚠ SW ANT YBC1-012 (EA)
4-1	BV-332107	⚠ ANT BOOSTER YBC1-003 (EO)
4-2	BT-742679	⚠ TRANS POWER VUT-8KG (EG/EO)
4-2	BT-742680	⚠ TRANS POWER VUT-8KK (EK)
4-2	BT-742681	⚠ TRANS POWER VUT-8KS(EA)
4-3	ER-742560	⚠ R CT 10W 1R0J (R493)
4-4	ET-742509	⚠ TR 2SD635 (Q403, 404)
4-5	ED-710002	⚠ D THYRISTOR CR3CM-1 (SR401)
4-6x	EC-708739	⚠ C MP 473M 250DC
4-7x	EF-742606	⚠ FUSE T 250V 1.0A (F901) (EK/EA)
4-8	ES-705534	⚠ SW SLIDE TKR-22293 (SW902)
4-9	ES-705533	⚠ SW SEESAW SDE3S2023 (SW901)
4-10	ES-742504	SW SLIDE SSMC1200 (SW903)
4-11	EJ-742516	⚠ SOCKET 2P INLET S-16453
4-12	EZ-742517	STRAIN RELIEF SR-5N-4
4-13	EW-742522	DC CORD R-457B
4-14	EW-710047	CABLE SIGNAL KD243831
4-15	SP-742548	⚠ PANEL REAR VU-88EG, EO (EG)
4-15	SP-742555	⚠ PANEL FEAR VU-88EK (EK)
4-15	SP-742570	PANEL REAR VU-88EA
4-16	EJ-710000	SOCKET COAX F TYPE BRF-42
4-17	EW-315767	⚠ AC CORD 2 CORES KP-419C/KS-15 E (EG/EO)
4-17	EW-322400	⚠ AC CORD 2 CORES GTBS-2F/KS-15 B (EK)
4-17	EW-322401	⚠ AC CORD 2 CORES KP-560/S-15 S (EA)
4-18x	EW-321758	CORD VY-15 ANTENNA CABLE

FINAL ASSEMBLY BLOCK


⑥
①
INFRARED RAY DETECTOR
PROGRAM
CLOCK/START TIME
STOP TIME
TV CHANNEL
CHARGE
FUNCTION
TIMER
ON
CHANNEL
DOWN
UP
AKAI
VU-88
②
⑤
④
③
⑦

5. FINAL ASSEMBLY BLOCK

REF. NO.	PARTS NO.	DESCRIPTION
5-1	BD-742595	PANEL FRONT BLK VU-88EG/ EK/EO
5-1	BD-742598	PANEL FRONT BLK VU-88EA
5-2	SK-708686	KNOB (A) VU-88
5-3	SK-708687	KNOB (B) VU-88
5-4	SP-742676	SLIDE PANEL VU-88
5-5	SM-342218	NAME PLATE AKAI VU-88EG
5-5	SM-342219	NAME PLATE AKAI VU-88EK
5-5	SM-342220	NAME PLATE VU-88EA
5-5	SM-342221	NAME PLATE VU-88EO
5-6	SP-742669	COVER UPPER VU-88EG
5-6	SP-742671	COVER UPPER VU-88EK
5-6	SP-742672	COVER UPPER VU-88EA
5-6	SP-742670	COVER UPPER VU-88EO
5-7	SP-708069	COVER LOWER VU-88

IV. MODEL RC-V88

1. FINAL ASSEMBLY BLOCK

REF. NO.	PARTS NO.	DESCRIPTION
1-1	AX-337304	REMOTE CONTROL UNIT RC-V88 (ENGLISH)
1-IC1	EI-780020	IC UPD1986C
1-TR1	ET-328553	TR 2SC945A K, P
1-TR2	ET-318604	TR 2SD545NP E, F
1-D1, 2	ED-706226	D LED SE303A INFRARAD
1-D3	ED-780019	D LED SEL1123W
1-SW1	ES-780015	SW SLIDE
1-x1	EC-780021	OSC CE

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BA-V2004A310A	6-1
BA-V2004A310B	6-1
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EV-332319	5-VR8
EV-332320	5-VR7
EV-332327	6-VR24
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EV-337950	6-VR10
EV-337951	6-VR8
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EV-337952	6-VR22
EV-337953	6-VR4, 5
EV-337953	6-VR7
EV-337953	6-VR9
EV-337953	6-VR18
EV-337953	6-VR2
EV-337957	5-VR5
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EW-332297	8-8x
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BA-742589	1-1
BD-742590	3-1
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BT-710016	2-4
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EC-316187	1-C11
EC-321096	1-C10
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EC-333996	1-C16
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EC-742552	1-C9
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ED-604541	1-D5
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EF-742603	1-F3, 4
EF-742606	2-9x
EI-213827	1-IC1
EI-326159	1-IC2
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EJ-704274	3-3
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ER-708861	1-R61
ER-742537	1-R1
ER-742539	1-R10
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ET-307997	1-Q13 to 14
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BD-742598	5-1
BT-742619	2-T103
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EC-321628	1-C440
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EC-333996	1-C458
EC-334011	1-C429
EC-334013	2-C121
EC-340104	1-C431
EC-340130	1-C441
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EI-330475	1-IC404
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EO-701411	2-L107
EO-701411	2-L109
EO-705485	2-L108
EO-742561	2-L110
EO-742571	2-L102
EO-742574	2-T102
EO-742575	2-T103
EO-742578	2-L111
EO-742579	2-L112
EO-742580	2-L112
EO-742581	2-L113
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EO-742655	2-L103
EO-742656	2-L103
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ER-742497	2-R138
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4. RC-V88

PARTS NO.	REF. NO.
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ED-706226	1-D1, 2
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EI-780020	1-IC1
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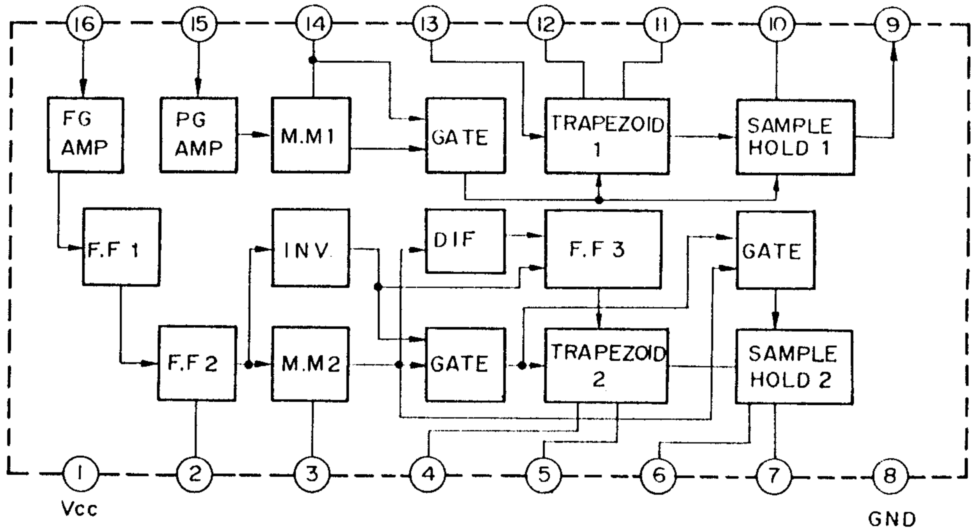

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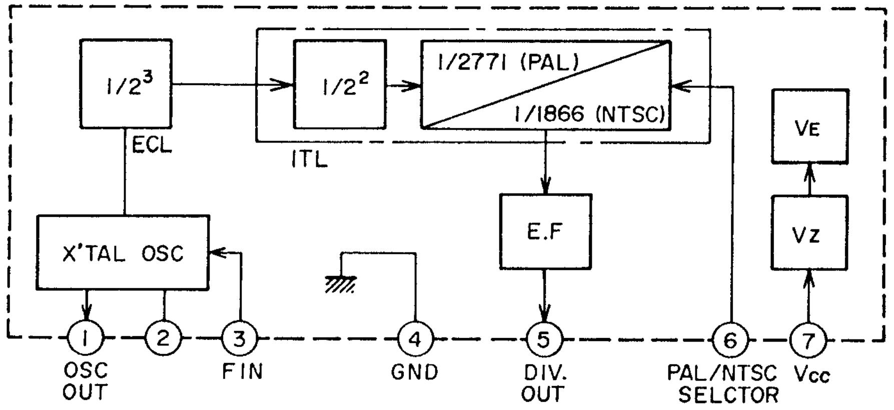
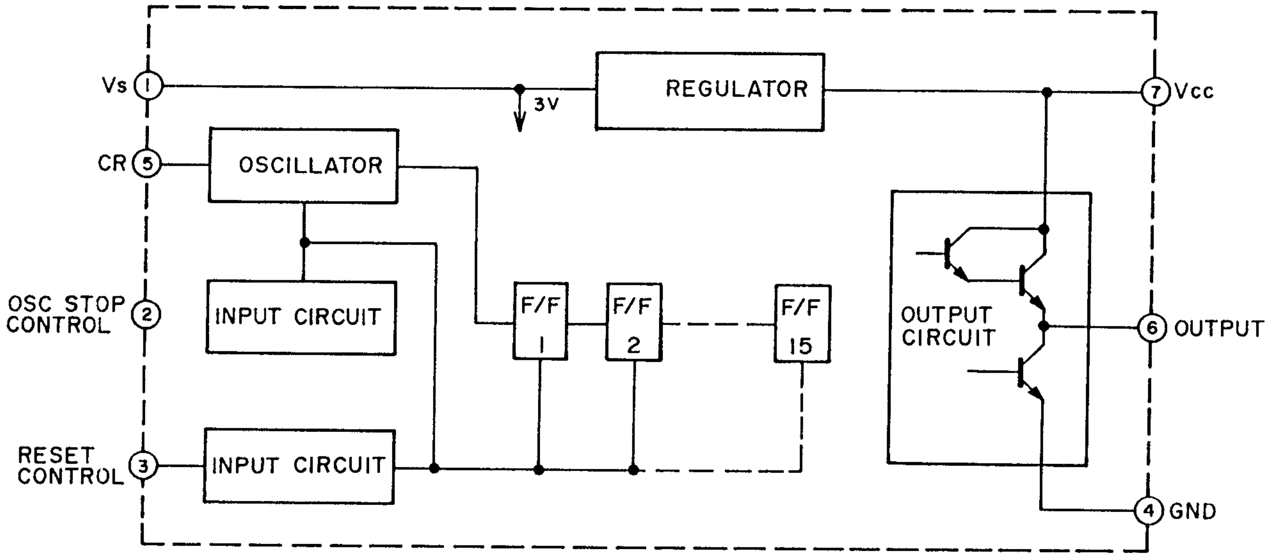
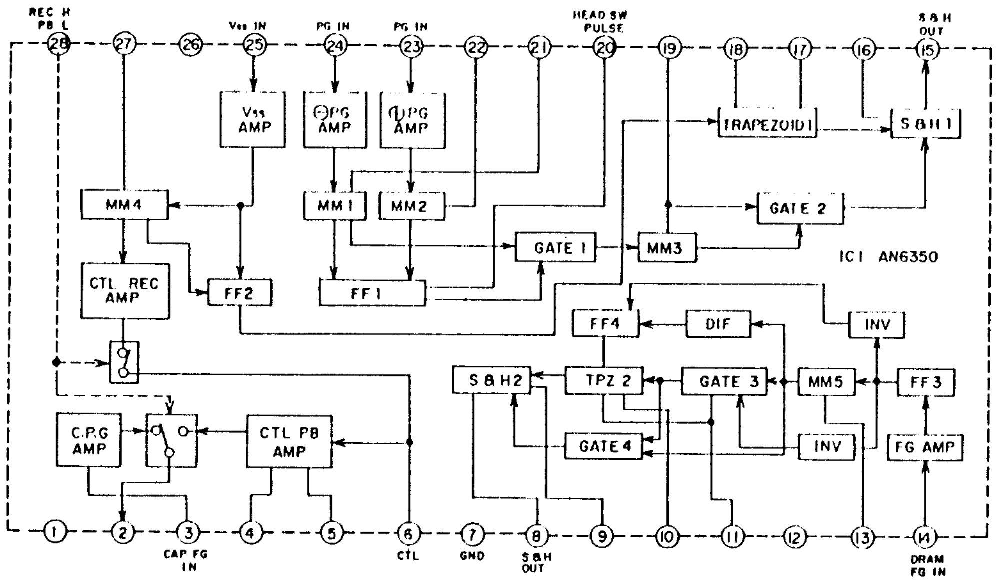

1/2³
ECL
1/2²
ITL
1/2771 (PAL)
1/1866 (NTSC)
VE
VZ
X'TAL OSC
E.F
1
2
3
4
5
6
7
OSC OUT
FIN
GND
DIV. OUT
PAL/NTSC SELCTOR
Vcc

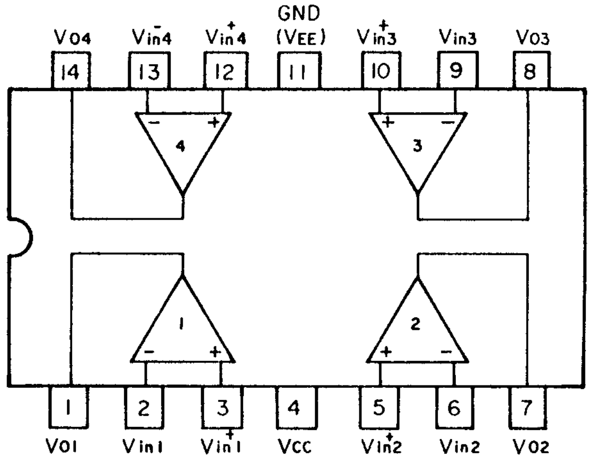
AN6780


Vs 1
REGULATOR
3V
7 Vcc
CR 5
OSCILLATOR
OSC STOP CONTROL 2
INPUT CIRCUIT
F/F 1
F/F 2
F/F 15
OUTPUT CIRCUIT
6 OUTPUT
RESET CONTROL 3
INPUT CIRCUIT
4 GND

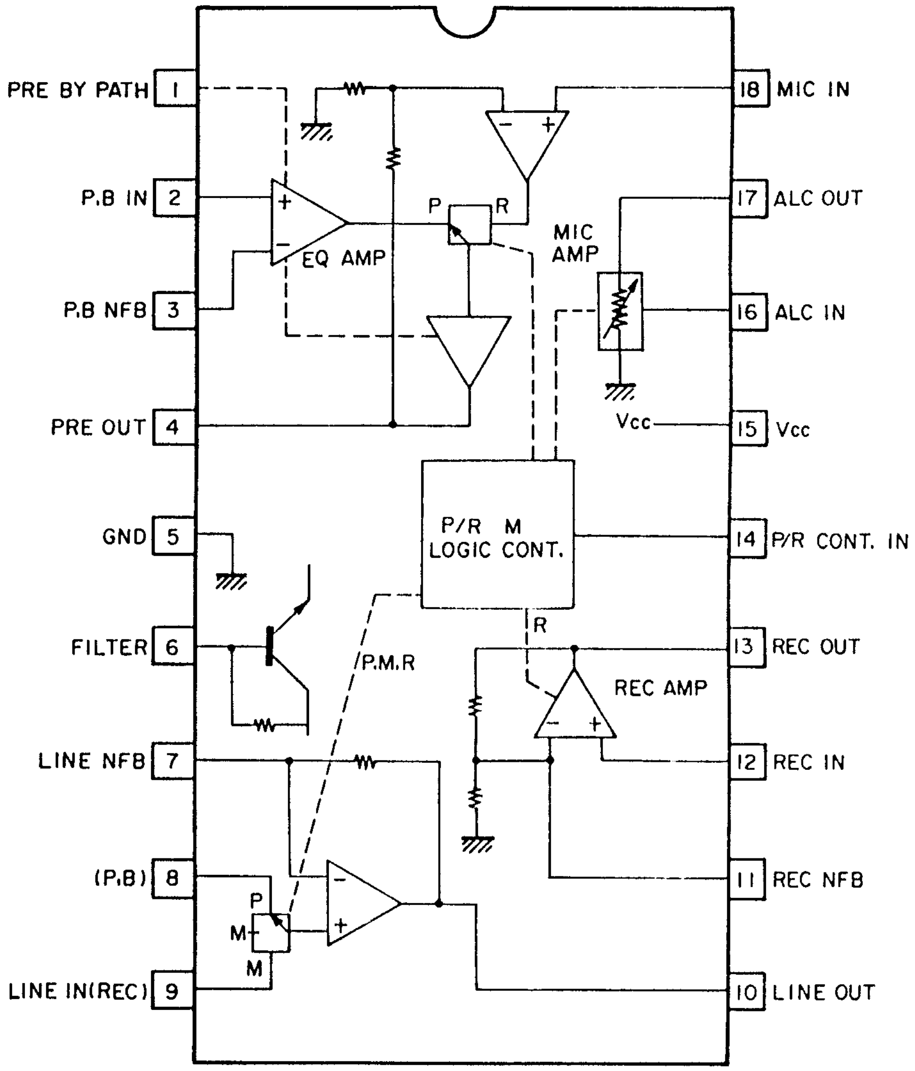
AN6350


REC H PB L
28
27
26
Vss IN
25
PG IN
24
PG IN
23
22
21
HEAD SW PULSE
20
19
18
17
16
S&H OUT
15
Vss AMP
(-)PG AMP
(+)PG AMP
TRAPEZOID 1
S&H 1
MM4
MM1
MM2
GATE 2
GATE 1
MM3
IC1 AN6350
CTL REC AMP
FF2
FF1
FF4
DIF
INV
S&H2
TPZ 2
GATE 3
MM5
FF3
C.P.G AMP
CTL PB AMP
GATE 4
INV
FG AMP
1
2
3
4
5
6
7
8
9
10
11
12
13
14
CAP FG IN
CTL
GND
S&H OUT
DRAM FG IN

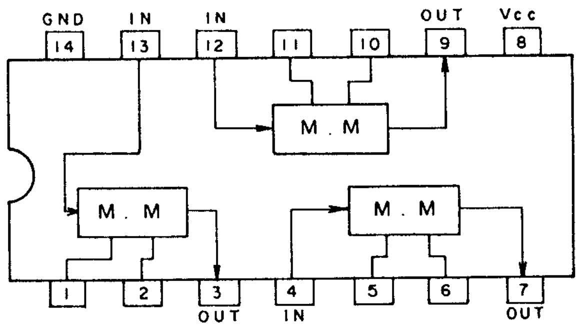
AN6564


VO4
Vin4
Vin4
GND (VEE)
Vin3
Vin3
VO3
14
13
12
11
10
9
8
4
3
1
2
1
2
3
4
5
6
7
VO1
Vin1
Vin1
Vcc
Vin2
Vin2
VO2

BA5102

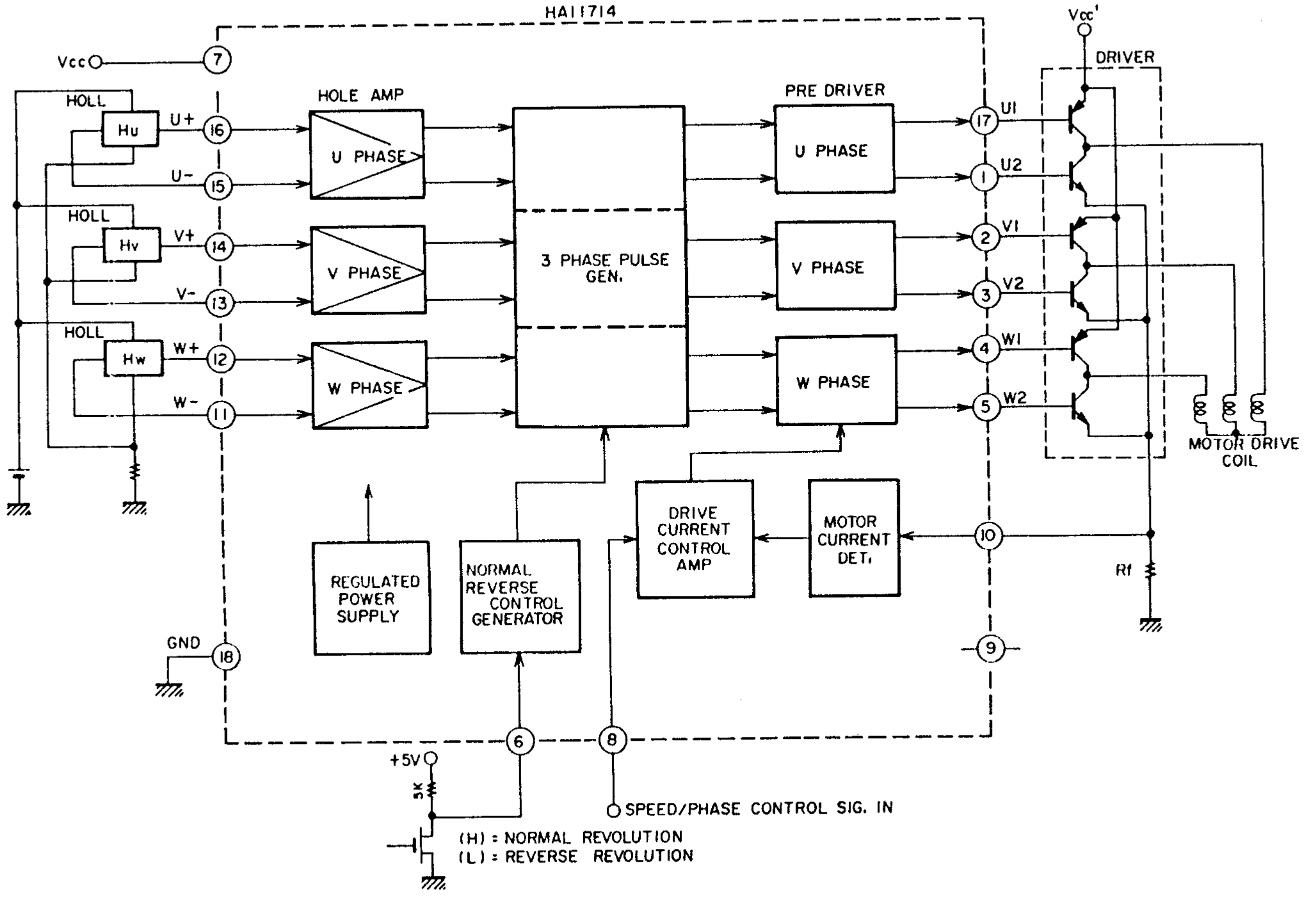

PRE BY PATH 1
P.B IN 2
P.B NFB 3
PRE OUT 4
GND 5
FILTER 6
LINE NFB 7
(P.B) 8
LINE IN(REC) 9
18 MIC IN
17 ALC OUT
16 ALC IN
15 Vcc
14 P/R CONT. IN
13 REC OUT
12 REC IN
11 REC NFB
10 LINE OUT
EQ AMP
P
R
MIC AMP
Vcc
P/R M LOGIC CONT.
R
P.M.R
REC AMP
P
M
M

DN850

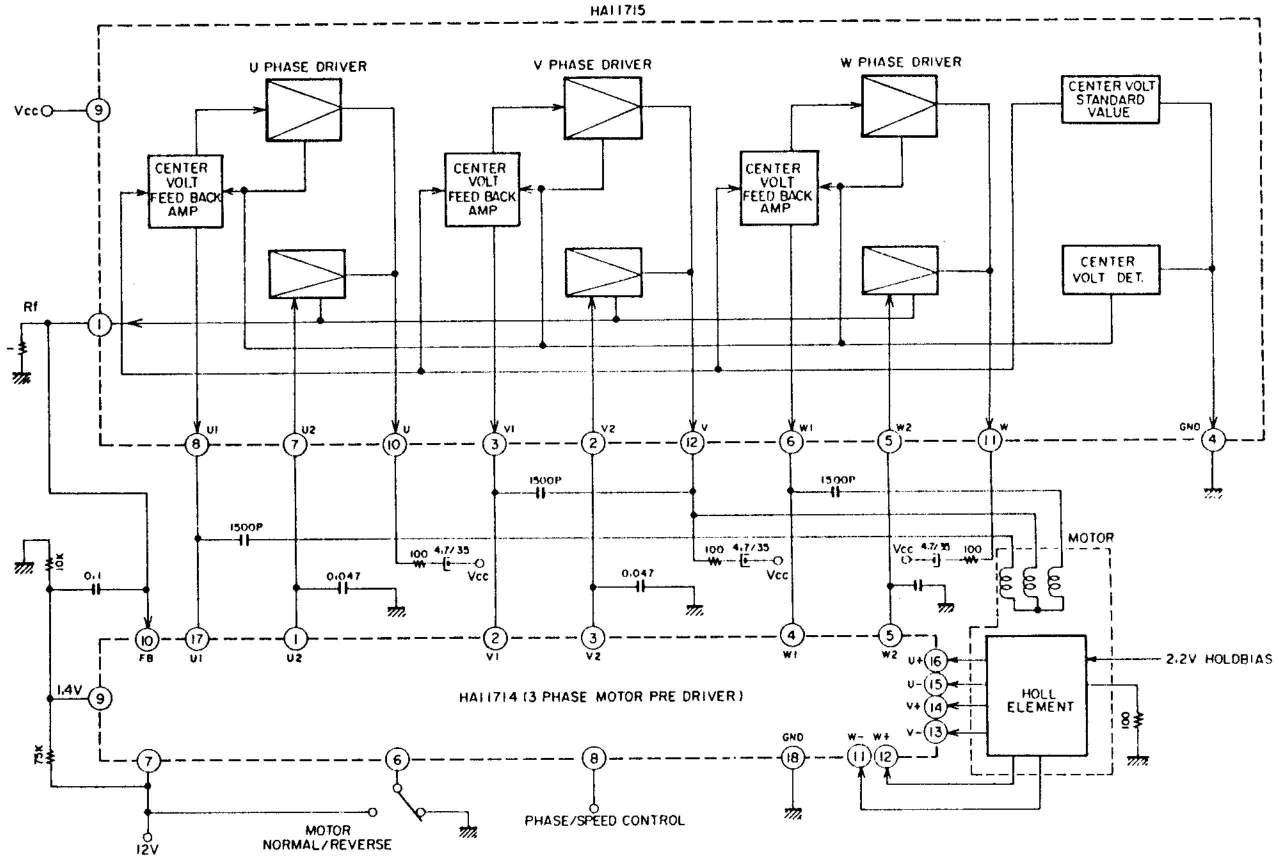

GND
IN
IN
OUT
Vcc
14
13
12
11
10
9
8
M . M
M . M
M . M
1
2
3
4
5
6
7
OUT
IN
OUT

M.M : Mono Multivibrator

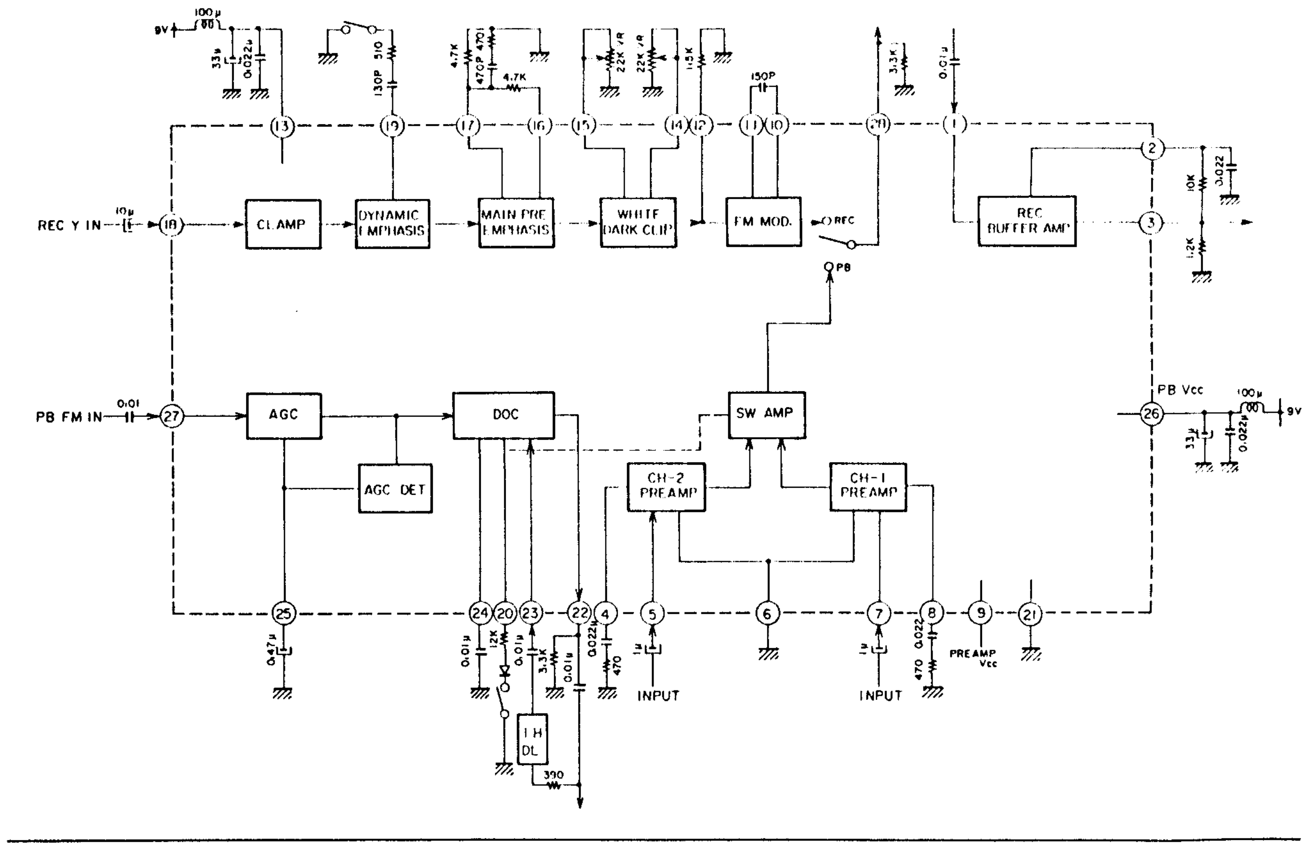
HA11714


HA11714
Vcc
7
HOLL
Hu
U+
U−
16
15
HOLL
Hv
V+
V−
14
13
HOLL
Hw
W+
W−
12
11
HOLE AMP
U PHASE
V PHASE
W PHASE
3 PHASE PULSE GEN.
PRE DRIVER
U PHASE
V PHASE
W PHASE
17 U1
1 U2
2 V1
3 V2
4 W1
5 W2
Vcc'
DRIVER
MOTOR DRIVE COIL
REGULATED POWER SUPPLY
NORMAL REVERSE CONTROL GENERATOR
DRIVE CURRENT CONTROL AMP
MOTOR CURRENT DET.
10
Rf
9
GND
18
6
8
+5V
5K
SPEED/PHASE CONTROL SIG. IN
(H) : NORMAL REVOLUTION
(L) : REVERSE REVOLUTION

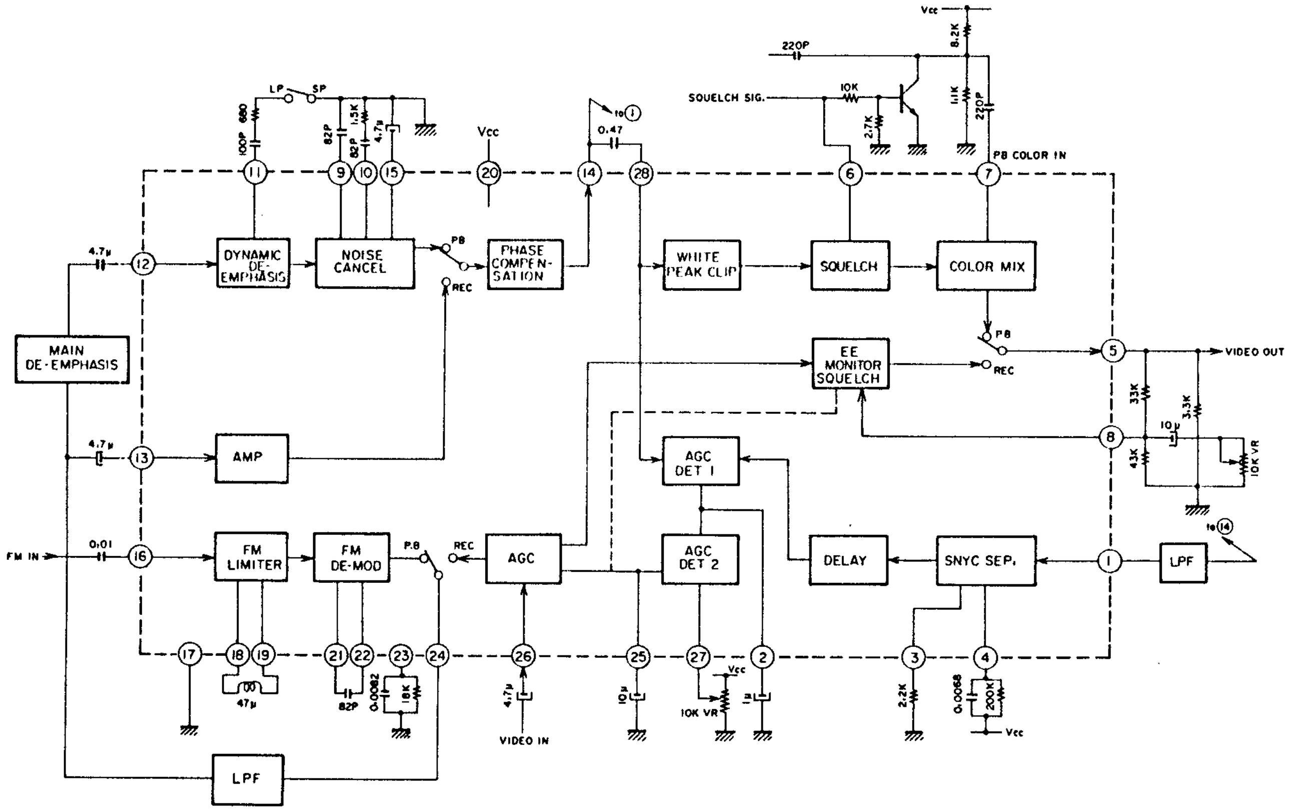
HA11715


HA11715
Vcc
9
U PHASE DRIVER
V PHASE DRIVER
W PHASE DRIVER
CENTER VOLT STANDARD VALUE
CENTER VOLT FEED BACK AMP
CENTER VOLT FEED BACK AMP
CENTER VOLT FEED BACK AMP
CENTER VOLT DET.
Rf
1
8 U1
7 U2
10 U
3 V1
2 V2
12 V
6 W1
5 W2
11 W
GND 4
1500P
1500P
1500P
100
4.7/35
Vcc
0.047
0.047
10K
0.1
MOTOR
10 FB
17 U1
1 U2
2 V1
3 V2
4 W1
5 W2
U+ 16
U− 15
V+ 14
V− 13
HOLL ELEMENT
2.2V HOLDBIAS
100
1.4V
9
75K
HA11714 (3 PHASE MOTOR PRE DRIVER)
7
6
8
GND 18
W− W+
11 12
12V
MOTOR NORMAL/REVERSE
PHASE/SPEED CONTROL

HA11724

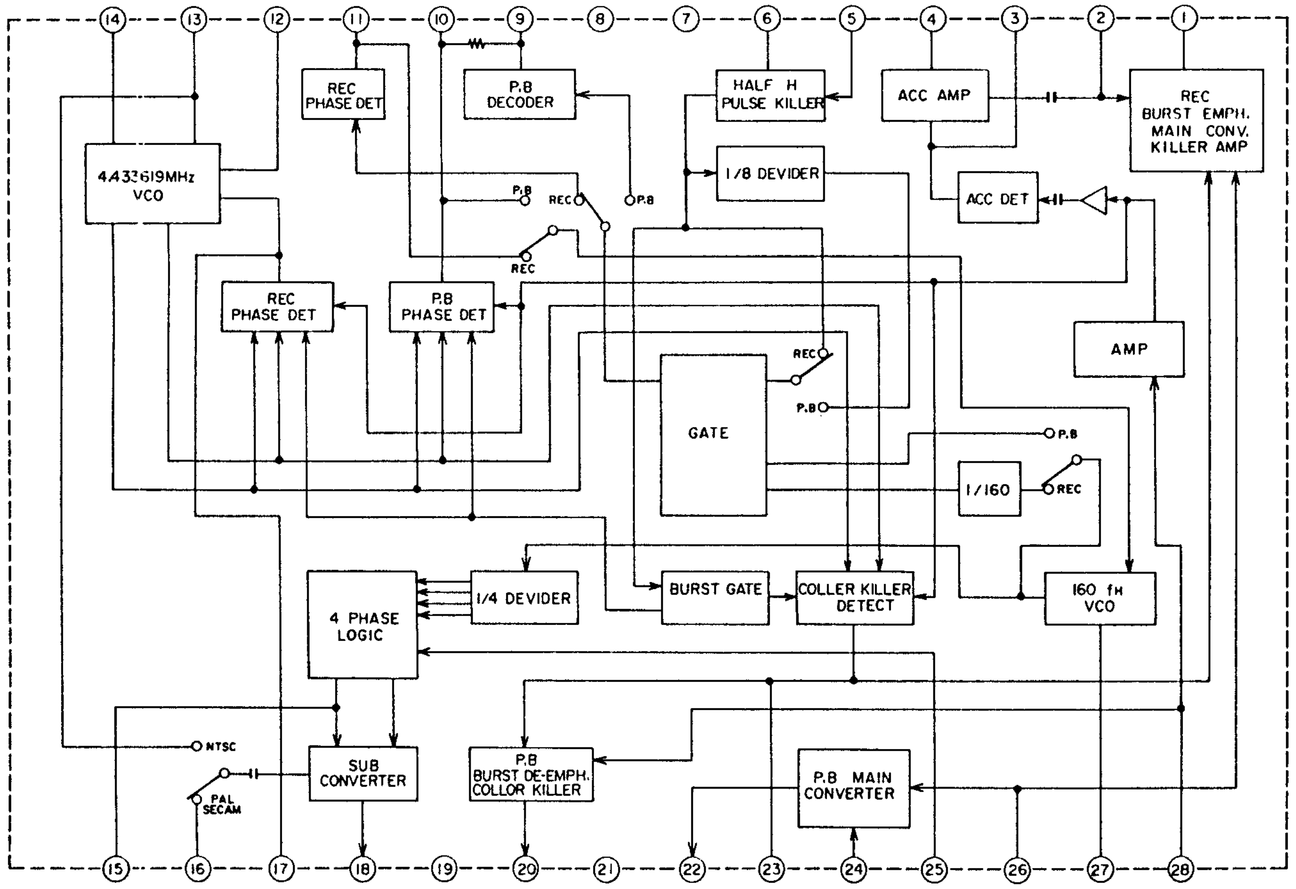

9V
100μ
33μ
0.022μ
130P
510
4.7K
470P
470
4.7K
22K
1.5K
150P
3.3K
0.01μ
13
19
17
16
15
14
12
11
10
20
1
2
3
10K
3.022
1.2K
REC Y IN
10μ
18
CLAMP
DYNAMIC EMPHASIS
MAIN PRE EMPHASIS
WHITE DARK CLIP
FM MOD.
REC
PB
REC BUFFER AMP
PB FM IN
0.01
27
AGC
AGC DET
DOC
SW AMP
CH-2 PREAMP
CH-1 PREAMP
PB Vcc
26
100μ
33μ
0.022μ
9V
25
24
20
23
22
4
5
6
7
8
9
21
0.47μ
0.01μ
12K
3.3K
0.022μ
470
1μ
INPUT
INPUT
PREAMP Vcc
1H DL
390

HA11725



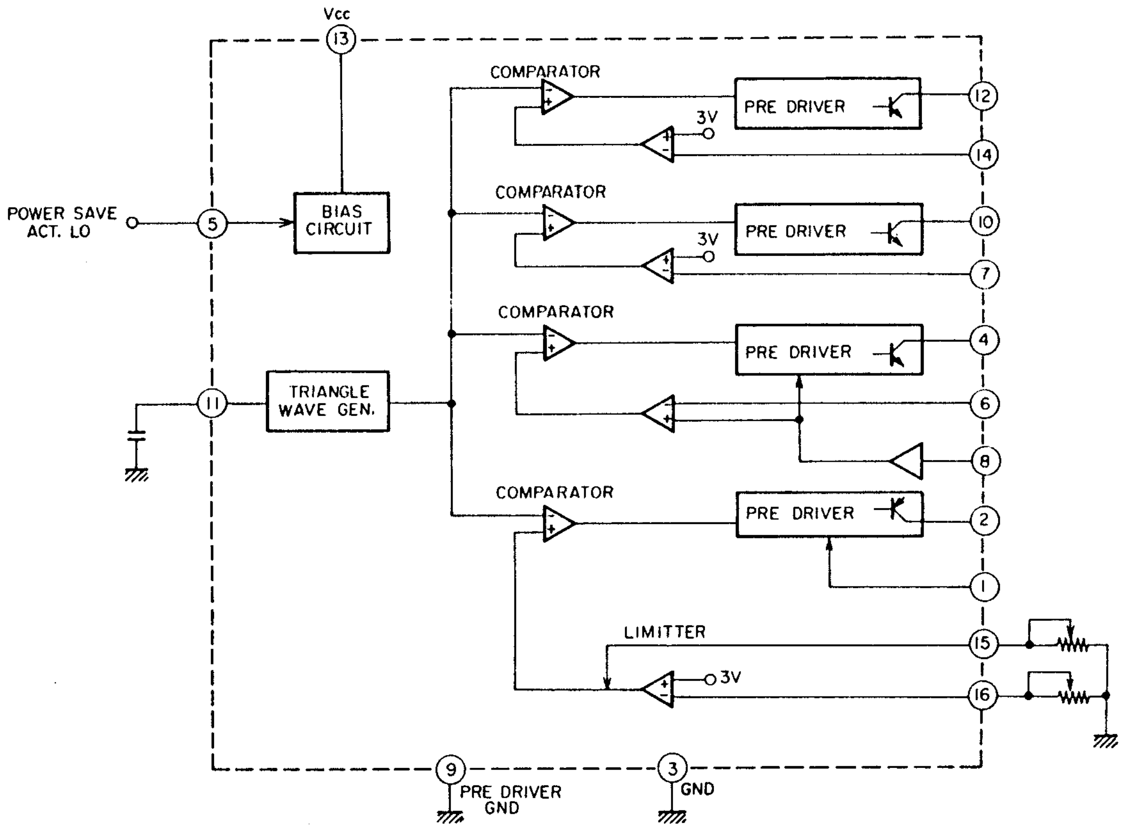
MAIN DE-EMPHASIS
DYNAMIC DE-EMPHASIS
NOISE CANCEL
PHASE COMPEN-SATION
WHITE PEAK CLIP
SQUELCH
COLOR MIX
EE MONITOR SQUELCH
AMP
AGC DET 1
AGC DET 2
FM LIMITER
FM DE-MOD
AGC
DELAY
SNYC SEP.
LPF
FM IN
VIDEO OUT
VIDEO IN
SQUELCH SIG.
PB COLOR IN
P.B
REC
LP
SP
Vcc
10K VR

HA11741



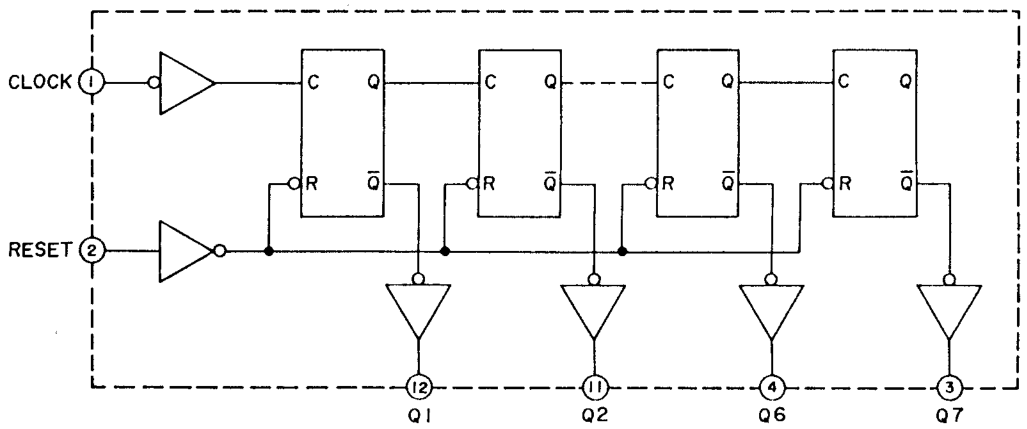
REC PHASE DET
P.B DECODER
HALF H PULSE KILLER
ACC AMP
REC BURST EMPH. MAIN CONV. KILLER AMP
4.433619MHz VCO
1/8 DEVIDER
ACC DET
REC PHASE DET
P.B PHASE DET
AMP
GATE
1/160
4 PHASE LOGIC
1/4 DEVIDER
BURST GATE
COLLER KILLER DETECT
160 fH VCO
SUB CONVERTER
P.B BURST DE-EMPH. COLLOR KILLER
P.B MAIN CONVERTER
NTSC
PAL SECAM
REC
P.B

HA13002



Vcc
COMPARATOR
PRE DRIVER
3V
POWER SAVE ACT. LO
BIAS CIRCUIT
TRIANGLE WAVE GEN.
LIMITTER
PRE DRIVER GND
GND

HD14024BP

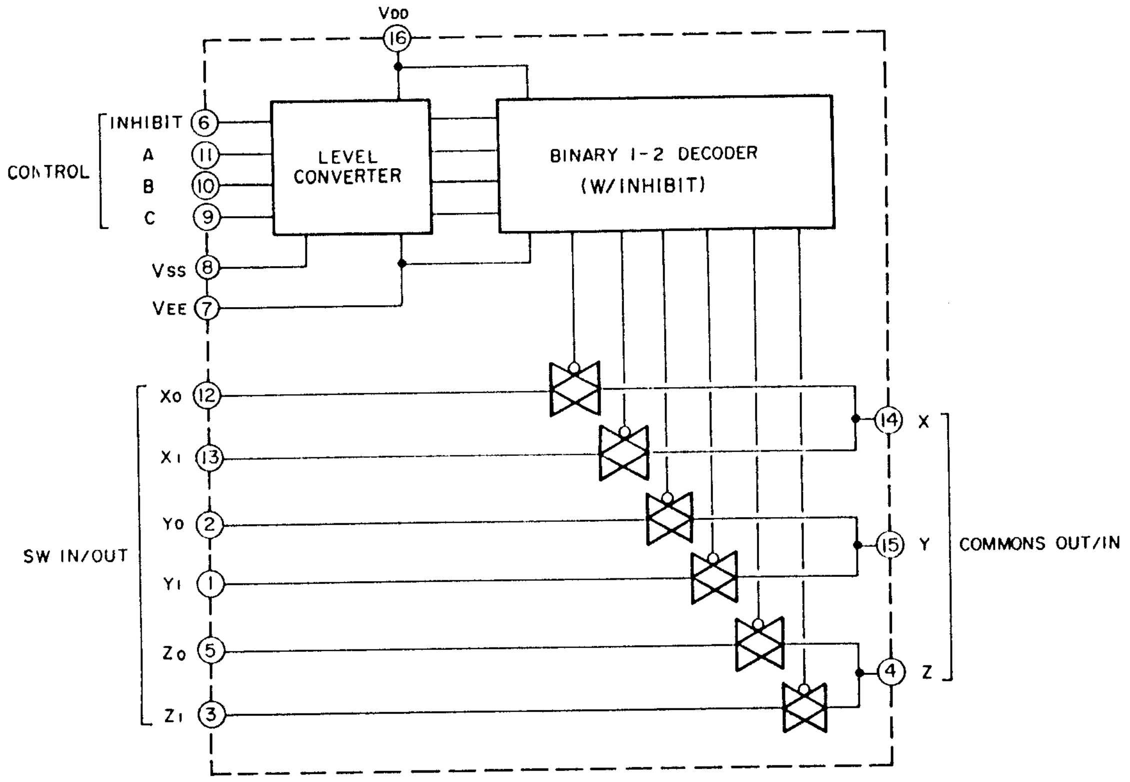


CLOCK
RESET
C
Q
R
Q̄
Q1
Q2
Q6
Q7

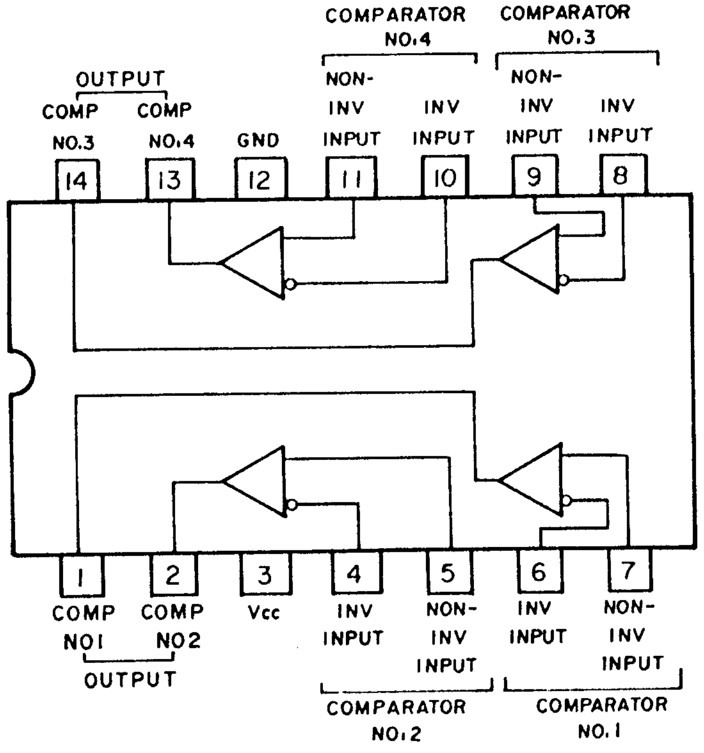
CONTROL INPUT				ON SW		
Inhibit	C	B	A			
L	L	L	L	Z_0	Y_0	X_0
L	L	L	H	Z_0	Y_0	X_1
L	L	H	L	Z_0	Y_1	X_0
L	L	H	H	Z_0	Y_1	X_1
L	H	L	L	Z_1	Y_0	X_0
L	H	L	H	Z_1	Y_0	X_1
L	H	H	L	X_1	Y_1	X_0
L	H	H	H	X_1	Y_1	X_1
H	X	X	X	–	–	–

L : LOW LEVEL
H : HIGH LEVEL
X : H or L

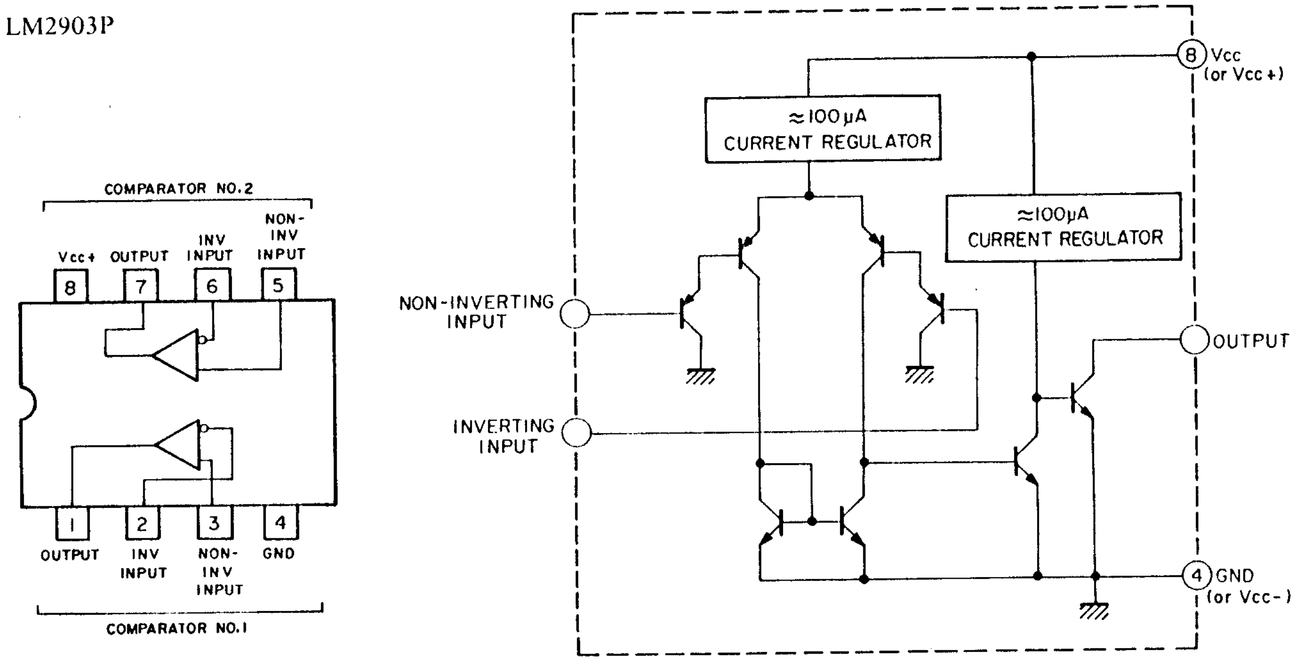
HD14053BP


VDD
16
CONTROL
INHIBIT 6
A 11
B 10
C 9
LEVEL CONVERTER
BINARY 1-2 DECODER (W/INHIBIT)
VSS 8
VEE 7
SW IN/OUT
X0 12
X1 13
Y0 2
Y1 1
Z0 5
Z1 3
14 X
15 Y
4 Z
COMMONS OUT/IN

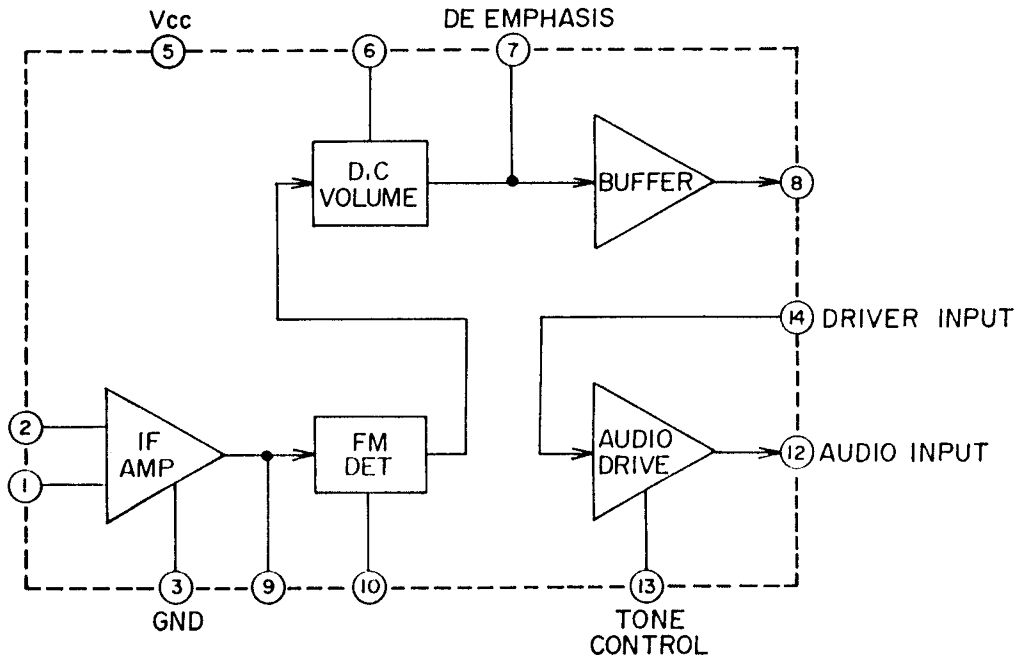
LM2901N


OUTPUT
COMP NO.3
COMP NO.4
GND
COMPARATOR NO.4
NON-INV INPUT
INV INPUT
COMPARATOR NO.3
NON-INV INPUT
INV INPUT
14
13
12
11
10
9
8
1
2
3
4
5
6
7
COMP NO1
COMP NO2
OUTPUT
Vcc
INV INPUT
NON-INV INPUT
COMPARATOR NO.2
INV INPUT
NON-INV INPUT
COMPARATOR NO.1

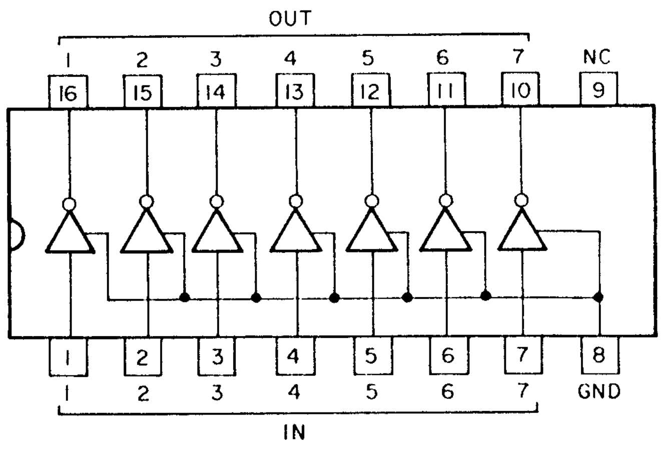
LM2903P


COMPARATOR NO.2
Vcc+
OUTPUT
INV INPUT
NON-INV INPUT
8
7
6
5
1
2
3
4
OUTPUT
INV INPUT
NON-INV INPUT
GND
COMPARATOR NO.1
8 Vcc (or Vcc+)
≈100μA CURRENT REGULATOR
≈100μA CURRENT REGULATOR
NON-INVERTING INPUT
INVERTING INPUT
OUTPUT
4 GND (or Vcc-)

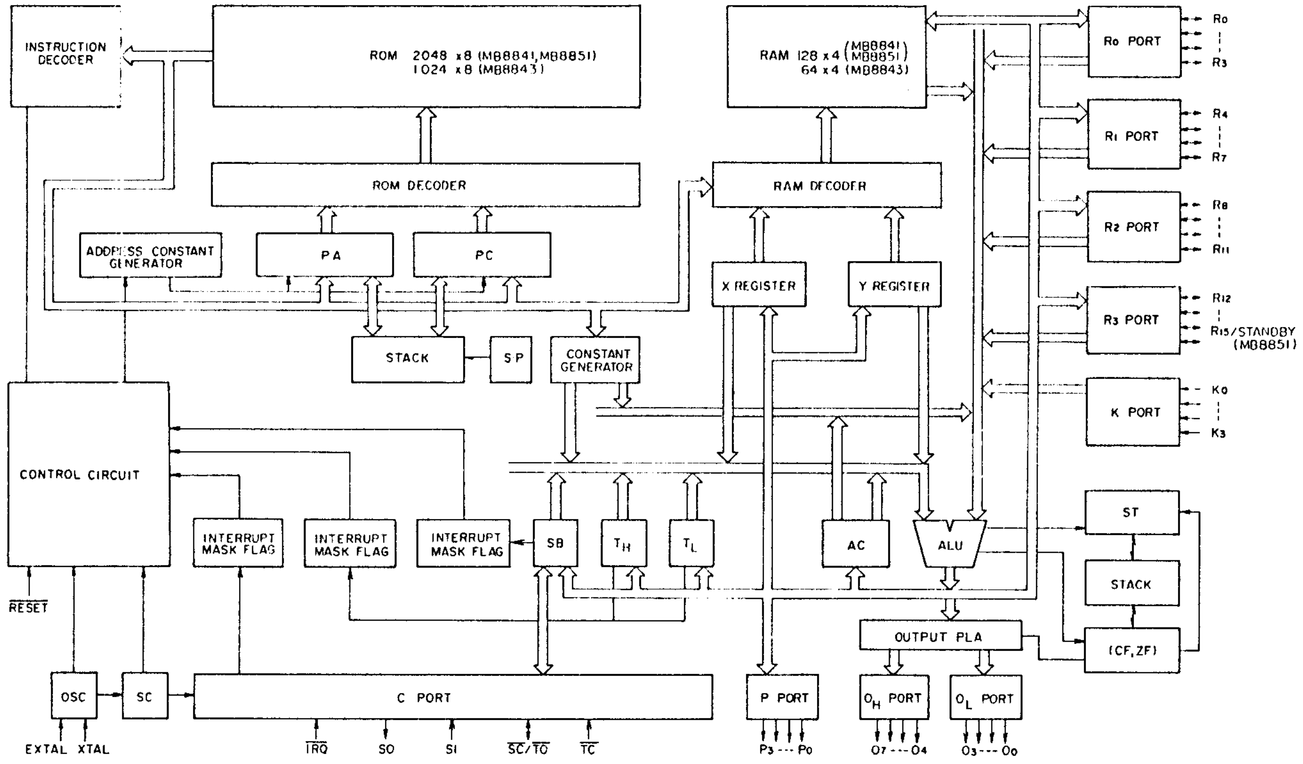
M5144P

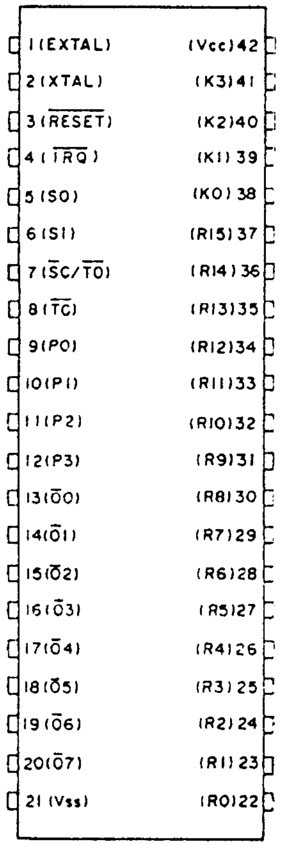

Vcc
5
6
DE EMPHASIS
7
D.C VOLUME
BUFFER
8
14 DRIVER INPUT
2
1
IF AMP
FM DET
AUDIO DRIVE
12 AUDIO INPUT
3
GND
9
10
13
TONE CONTROL

M54517P

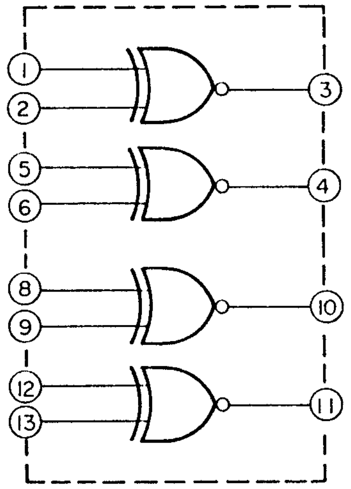

OUT
1
2
3
4
5
6
7
NC
16
15
14
13
12
11
10
9
1
2
3
4
5
6
7
8
GND
IN

MB8841-463M
MB8843-658M
MB8851-202L


INSTRUCTION DECODER
ROM 2048 x8 (MB8841,MB8851) 1024 x8 (MB8843)
RAM 128 x4 (MB8841) (MB8851) 64 x4 (MB8843)
R0 PORT
R0 … R3
R1 PORT
R4 … R7
R2 PORT
R8 … R11
R3 PORT
R12 … R15/STANDBY (MB8851)
K PORT
K0 … K3
ROM DECODER
RAM DECODER
ADDRESS CONSTANT GENERATOR
PA
PC
X REGISTER
Y REGISTER
STACK
SP
CONSTANT GENERATOR
CONTROL CIRCUIT
INTERRUPT MASK FLAG
INTERRUPT MASK FLAG
INTERRUPT MASK FLAG
SB
TH
TL
AC
ALU
ST
STACK
(CF,ZF)
OUTPUT PLA
RESET
OSC
SC
C PORT
P PORT
OH PORT
OL PORT
EXTAL XTAL
IRQ
SO
SI
SC/TO
TC
P3 --- P0
O7 --- O4
O3 --- O0

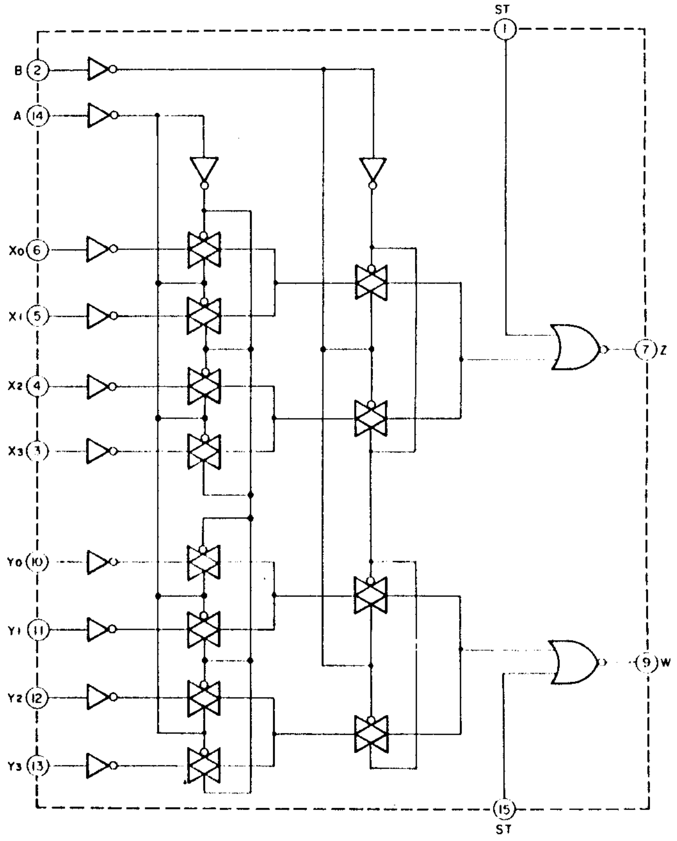

1(EXTAL)
(Vcc)42
2(XTAL)
(K3)41
3(RESET)
(K2)40
4(IRQ)
(K1)39
5(SO)
(K0)38
6(SI)
(R15)37
7(SC/TO)
(R14)36
8(TC)
(R13)35
9(P0)
(R12)34
10(P1)
(R11)33
11(P2)
(R10)32
12(P3)
(R9)31
13(O0)
(R8)30
14(O1)
(R7)29
15(O2)
(R6)28
16(O3)
(R5)27
17(O4)
(R4)26
18(O5)
(R3)25
19(O6)
(R2)24
20(O7)
(R1)23
21(Vss)
(R0)22

MC14077BCP


1
2
3
5
6
4
8
9
10
12
13
11

VDD = PIN 14
VSS = PIN 7
(BOTH DEVICES)

MC14539BCP

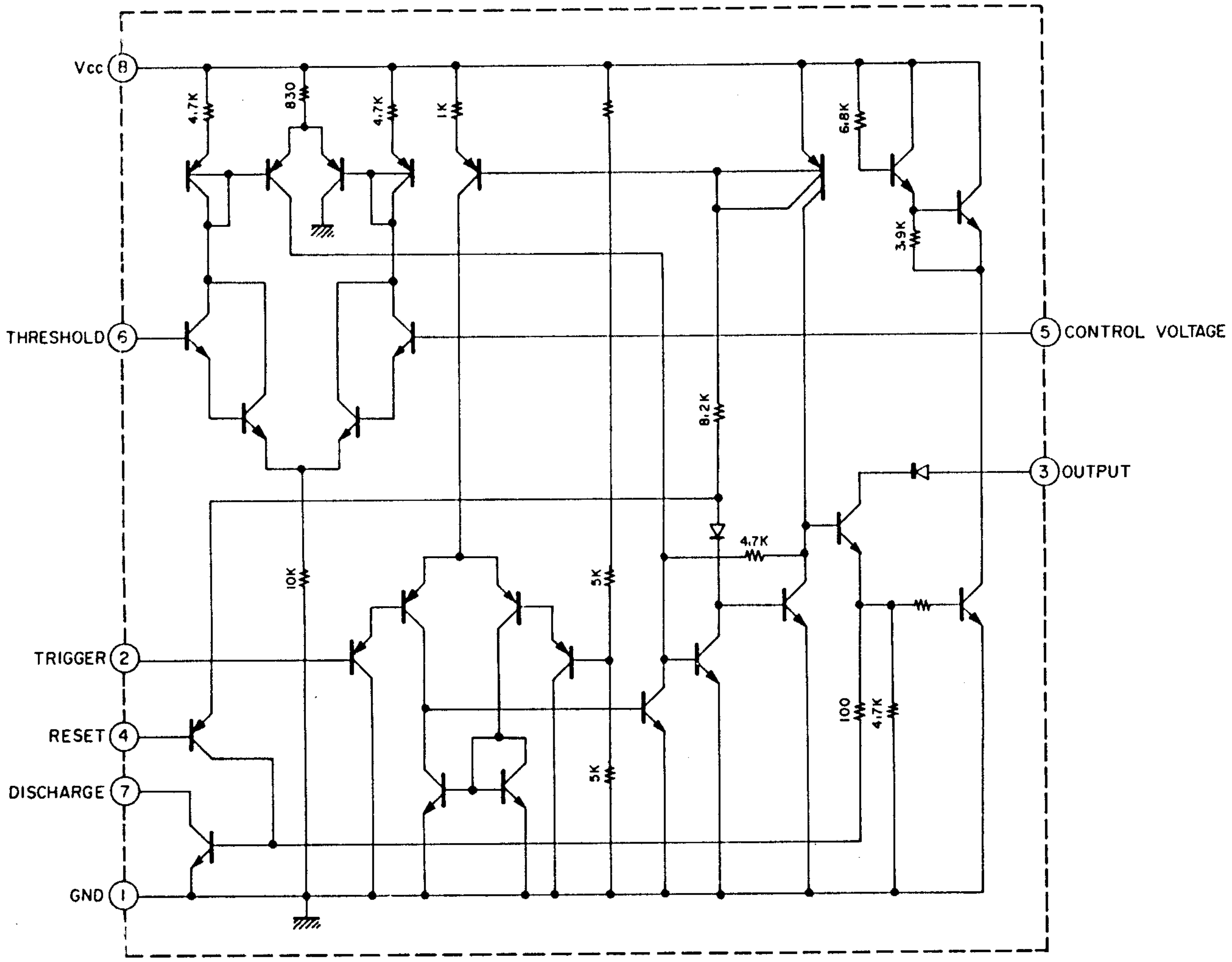

ST
1
B 2
A 14
X0 6
X1 5
X2 4
X3 3
Y0 10
Y1 11
Y2 12
Y3 13
7 Z
9 W
15
ST

THRUST TABLE

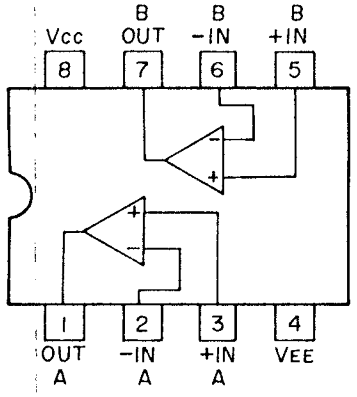
ADDRESS INPUTS		DATA INPUTS					OUT-PUTS
		X3	X2	X1	X0		
B	A	Y3	Y2	Y1	Y0	ST, ST	Z, W
X	X	X	X	X	X	1	0
0	0	X	X	X	0	0	0
0	0	X	X	X	1	0	1
0	1	X	X	0	X	0	0
0	1	X	X	1	X	0	1
1	0	X	0	X	X	0	0
1	0	X	1	X	X	0	1
1	1	0	X	X	X	0	0
1	1	1	X	X	X	0	1

X = Don't Care

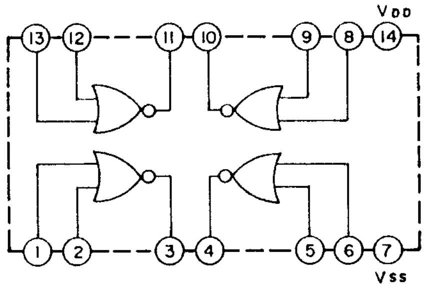
NJM555D


Vcc 8
4.7K
830
4.7K
1K
6.8K
3.9K
THRESHOLD 6
5 CONTROL VOLTAGE
8.2K
3 OUTPUT
4.7K
10K
5K
TRIGGER 2
RESET 4
DISCHARGE 7
100
4.7K
5K
GND 1

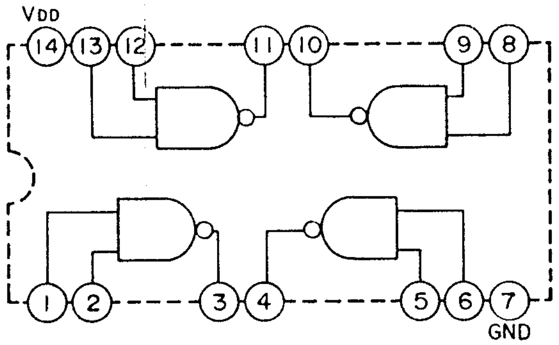
NJM4558D


Vcc
8
B
OUT
7
B
−IN
6
B
+IN
5
1
OUT
A
2
−IN
A
3
+IN
A
4
VEE

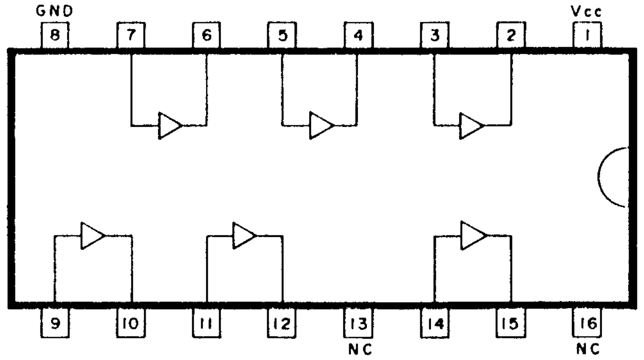
TC4001BP


13
12
11
10
9
8
14
VDD
1
2
3
4
5
6
7
Vss

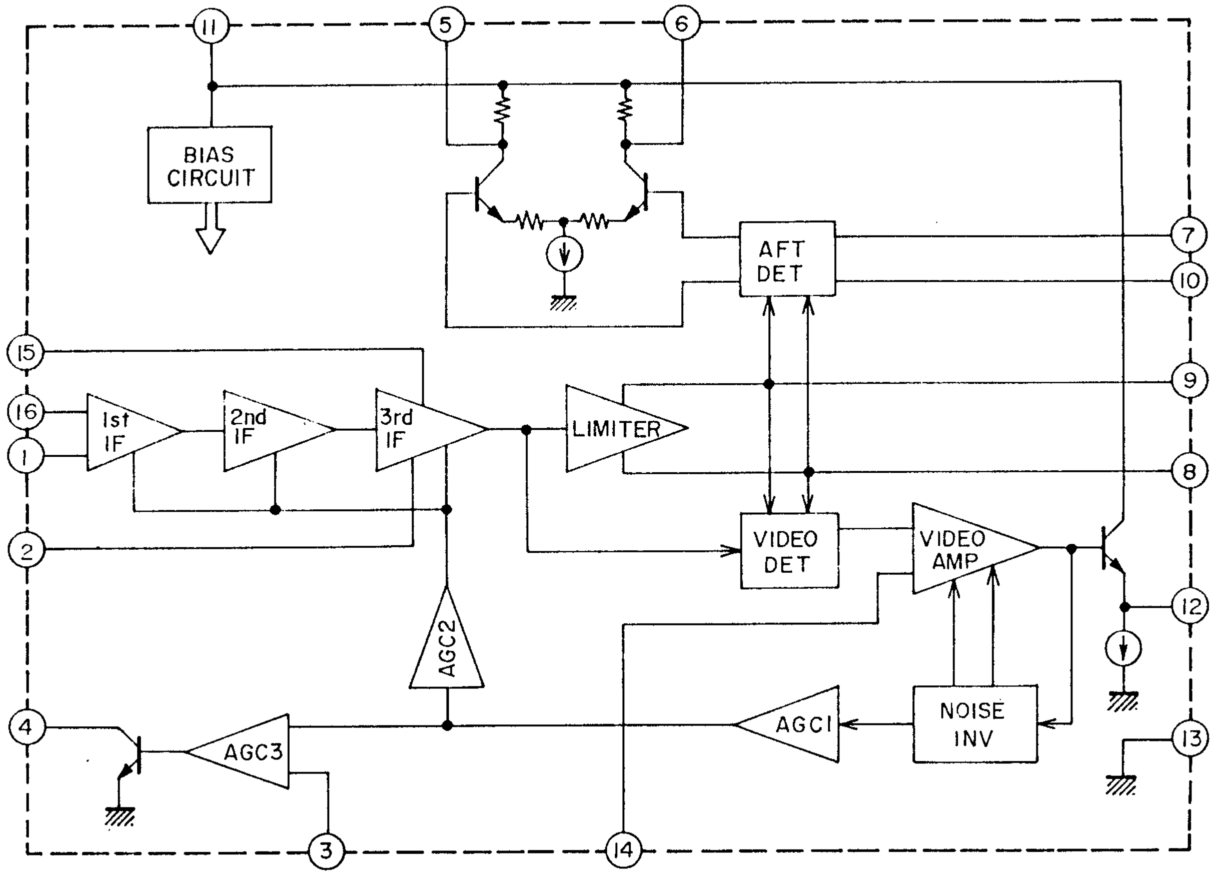
TC4011BP/MC14011B


VDD
14
13
12
11
10
9
8
1
2
3
4
5
6
7
GND

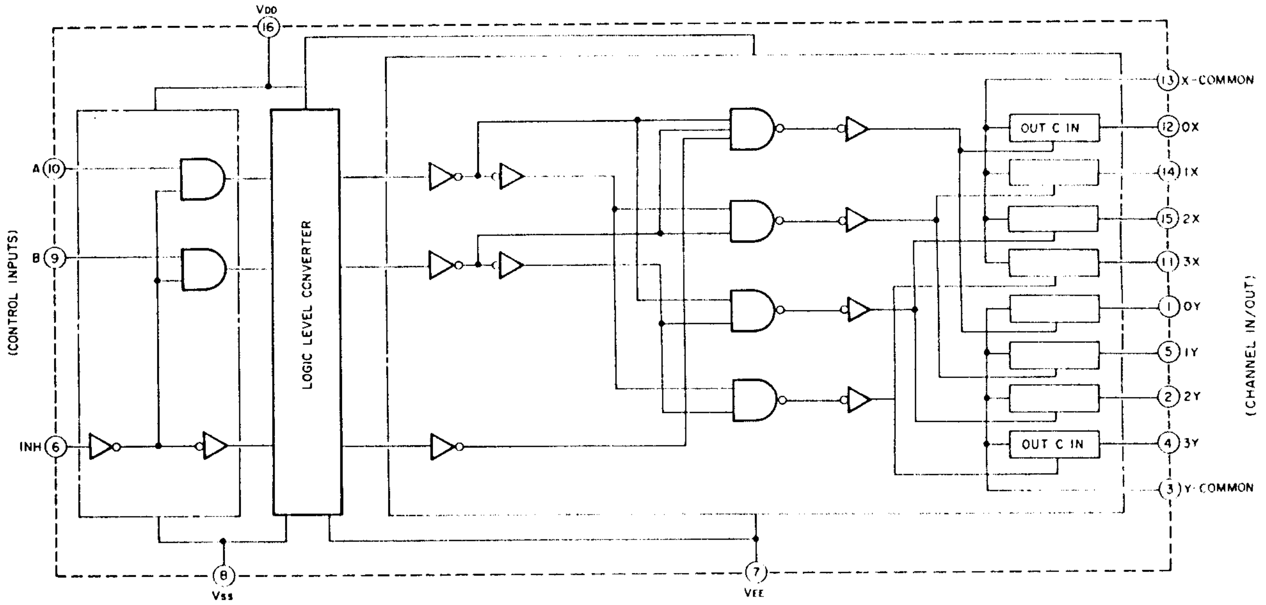
TC4050BP/MC14050BP


GND
8
7
6
5
4
3
2
Vcc
1
9
10
11
12
13
NC
14
15
16
NC

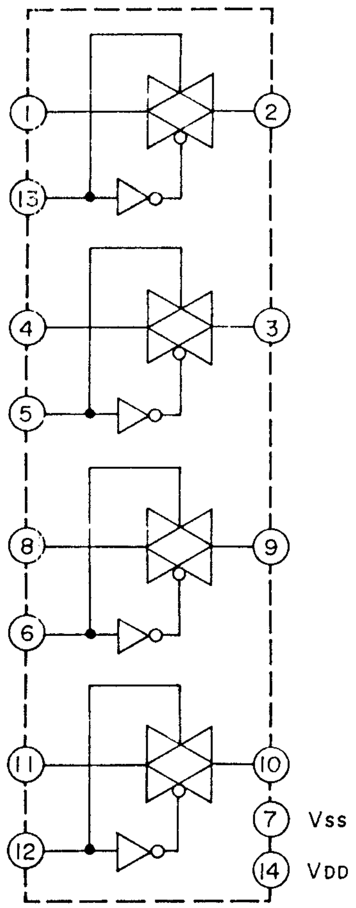
TA7607AP


11
5
6
BIAS
CIRCUIT
AFT
DET
7
10
15
16
1
Ist
IF
2nd
IF
3rd
IF
LIMITER
9
8
2
VIDEO
DET
VIDEO
AMP
12
AGC2
4
AGC3
AGCI
NOISE
INV
13
3
14

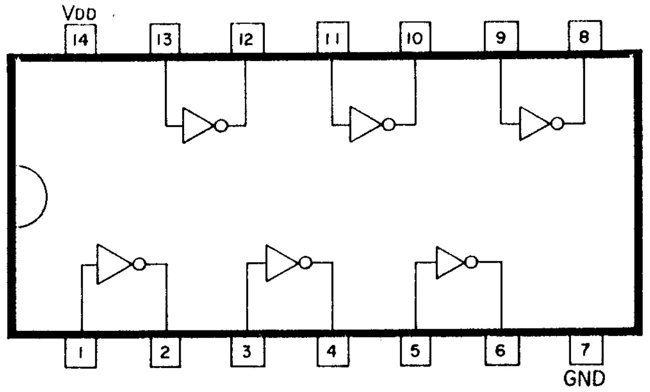
TC4052BP/HD14052BP


VDD
16
13 X-COMMON
12 0X
14 1X
15 2X
11 3X
1 0Y
5 1Y
2 2Y
4 3Y
3 Y-COMMON
A 10
B 9
INH 6
(CONTROL INPUTS)
LOGIC LEVEL CONVERTER
OUT C IN
OUT C IN
(CHANNEL IN/OUT)
8
Vss
7
VEE

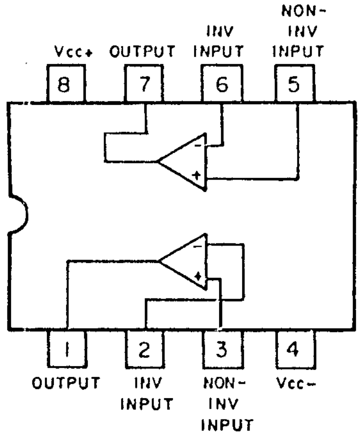
TC4066BP/MC14066BP


1
2
13
4
3
5
8
9
6
11
10
12
7 Vss
14 VDD

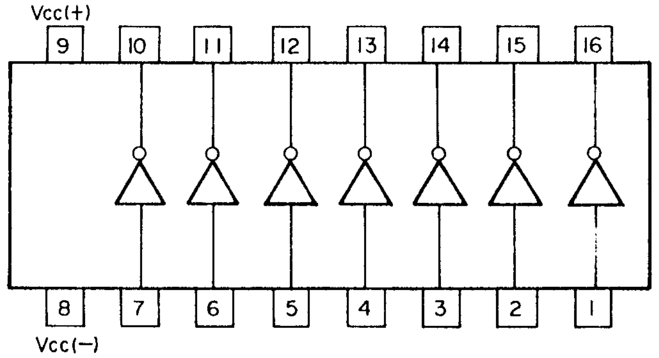
TC4069UBP/MC14069UB


VDD
14
13
12
11
10
9
8
1
2
3
4
5
6
7
GND

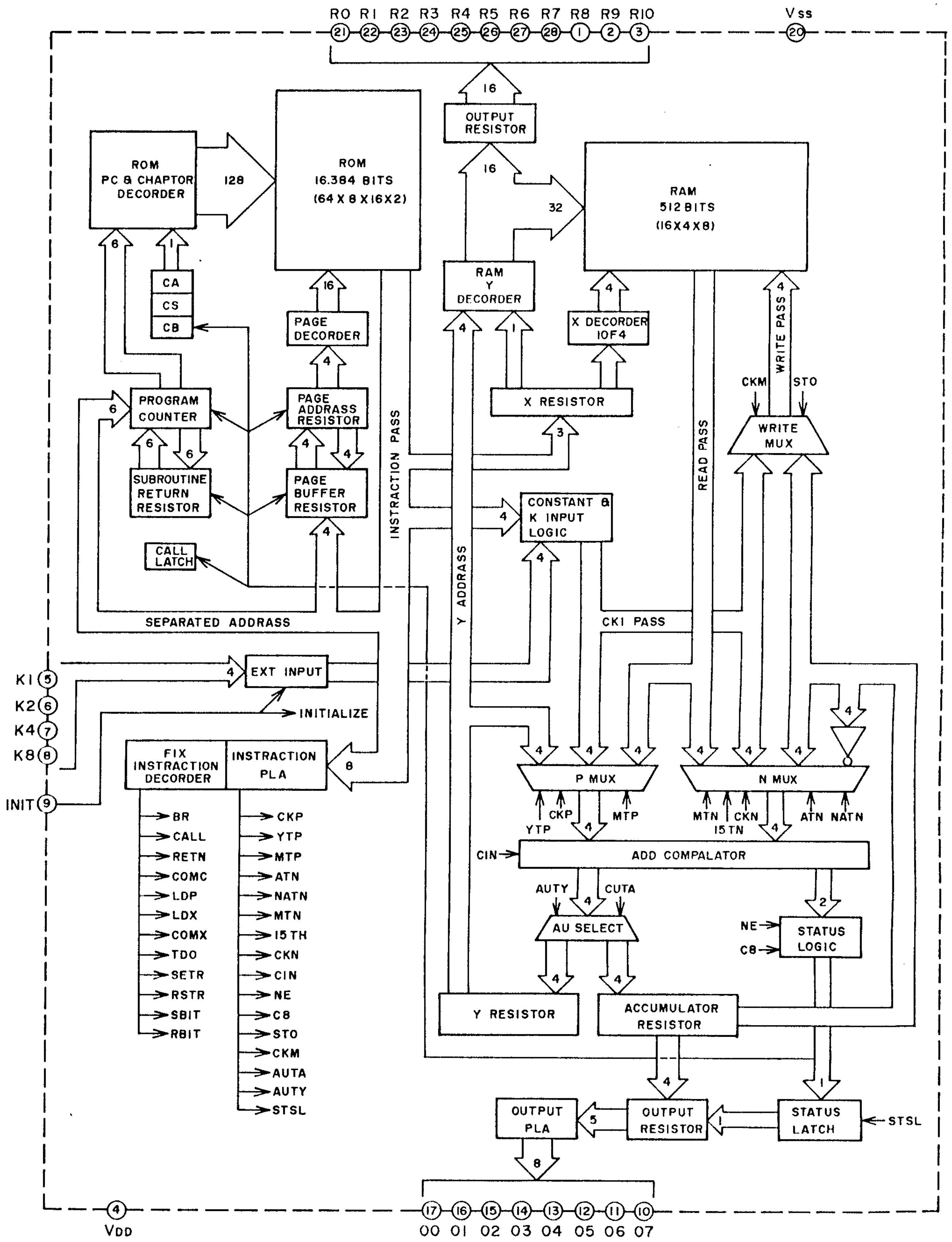
TL082CP


Vcc+
OUTPUT
INV INPUT
NON-INV INPUT
8
7
6
5
1
2
3
4
OUTPUT
INV INPUT
NON-INV INPUT
Vcc−

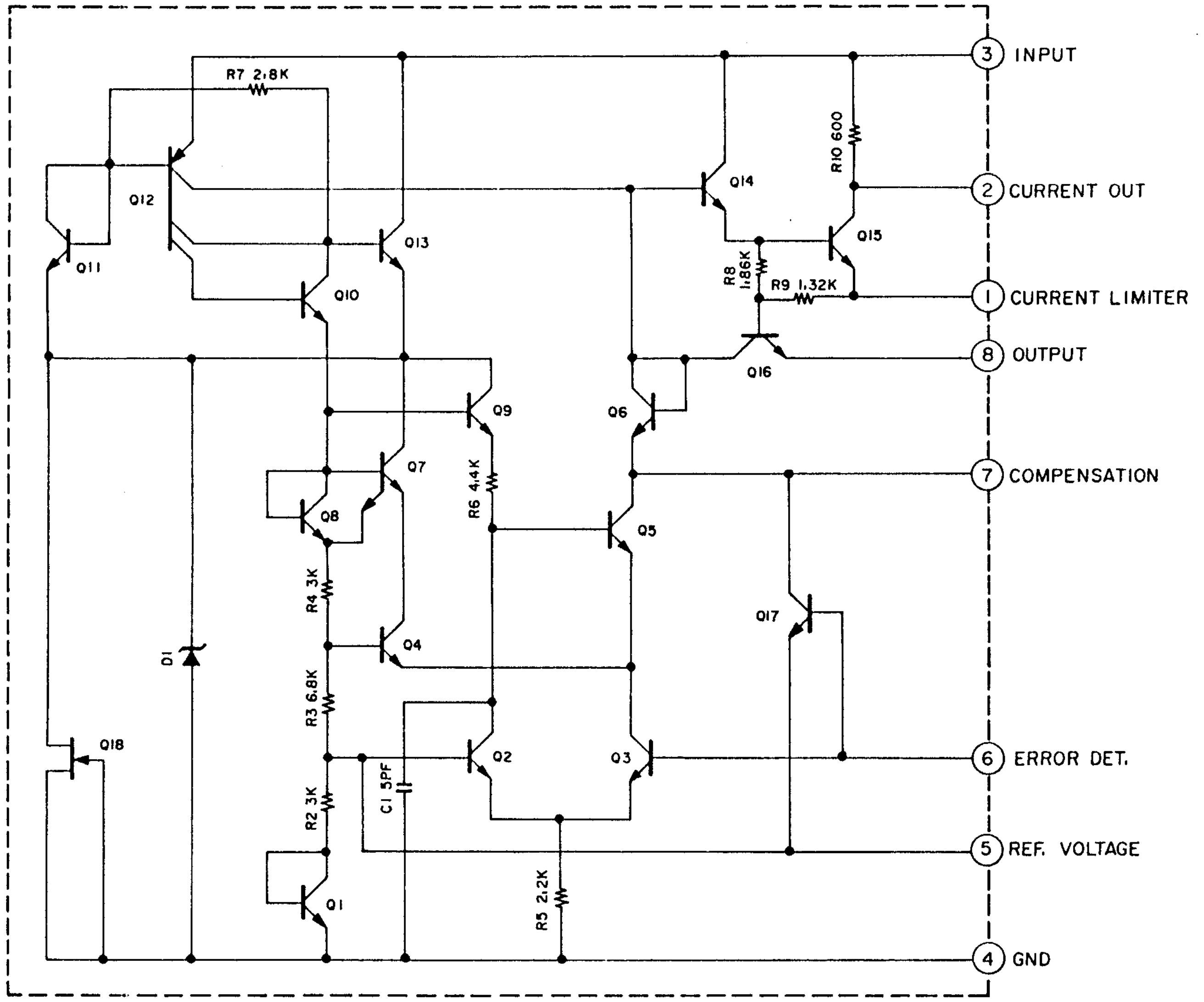
μPA80C


Vcc(+)
9
10
11
12
13
14
15
16
8
7
6
5
4
3
2
1
Vcc(−)

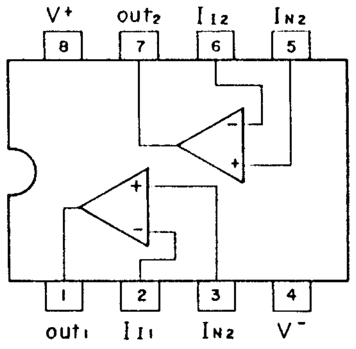
TMS1100


R0 R1 R2 R3 R4 R5 R6 R7 R8 R9 R10
21 22 23 24 25 26 27 28 1 2 3
Vss
20
16
OUTPUT RESISTOR
16
ROM PC & CHAPTOR DECORDER
128
ROM 16.384 BITS (64 X 8 X 16X2)
32
RAM 512 BITS (16X4X8)
8
1
CA
CS
CB
16
PAGE DECORDER
4
RAM Y DECORDER
4
1
X DECORDER 1OF4
4
WRITE PASS
CKM
STO
WRITE MUX
READ PASS
6
PROGRAM COUNTER
PAGE ADDRASS RESISTOR
X RESISTOR
3
6
6
4
4
SUBROUTINE RETURN RESISTOR
PAGE BUFFER RESISTOR
INSTRACTION PASS
Y ADDRASS
4
CONSTANT & K INPUT LOGIC
4
CALL LATCH
4
SEPARATED ADDRASS
CKI PASS
K1 5
K2 6
K4 7
K8 8
INIT 9
4
EXT INPUT
INITIALIZE
FIX INSTRACTION DECORDER
INSTRACTION PLA
8
BR
CALL
RETN
COMC
LDP
LDX
COMX
TDO
SETR
RSTR
SBIT
RBIT
CKP
YTP
MTP
ATN
NATN
MTN
15TH
CKN
CIN
NE
C8
STO
CKM
AUTA
AUTY
STSL
4
4
4
4
4
4
4
P MUX
N MUX
YTP
CKP
MTP
MTN
CKN
15TN
ATN
NATN
4
4
CIN
ADD COMPALATOR
AUTY
CUTA
4
AU SELECT
2
NE
C8
STATUS LOGIC
4
4
Y RESISTOR
ACCUMULATOR RESISTOR
4
1
OUTPUT PLA
5
OUTPUT RESISTOR
1
STATUS LATCH
STSL
8
4
VDD
17 16 15 14 13 12 11 10
O0 O1 O2 O3 O4 O5 O6 O7

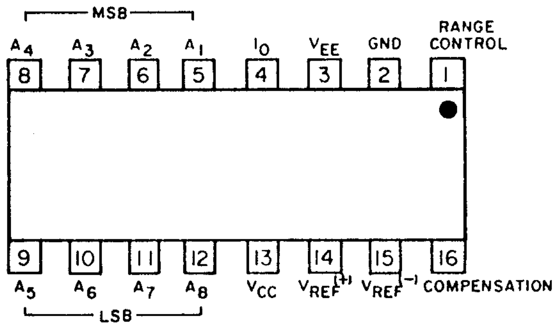
μPC141C/μPC305C

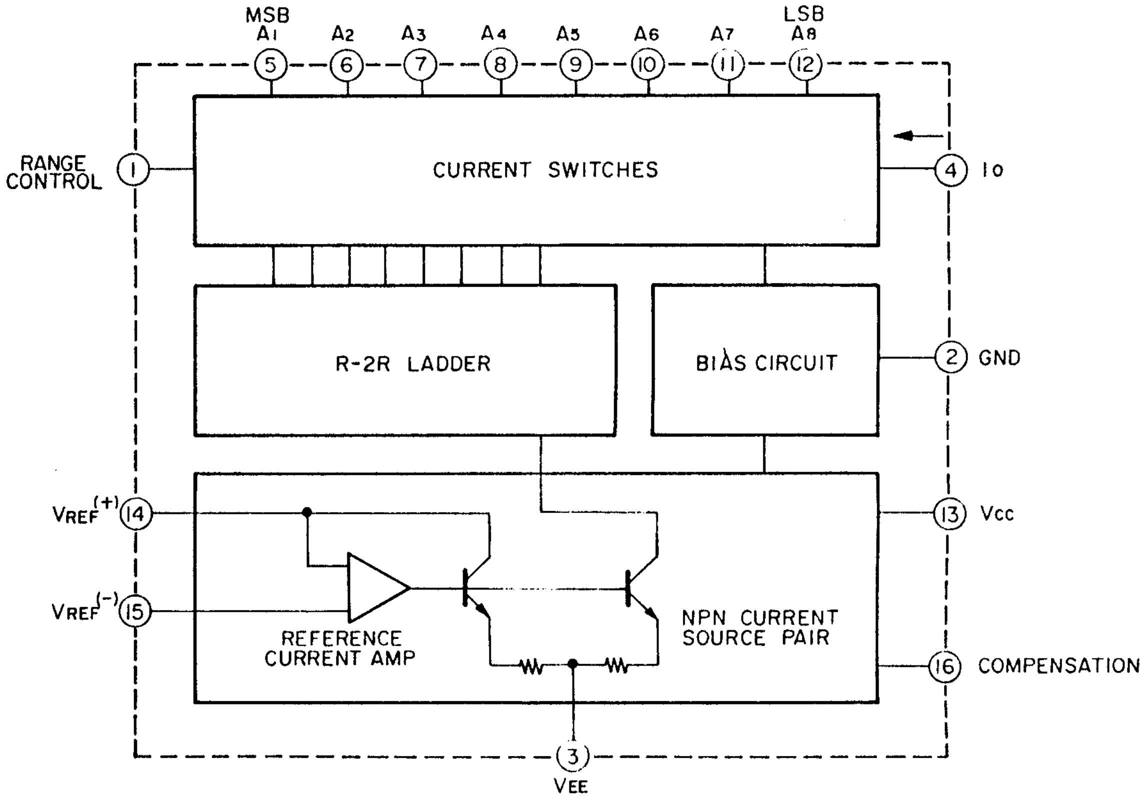

R7 2.8K
Q12
Q11
Q13
Q10
Q14
Q15
R10 600
R8 1.86K
R9 1.32K
Q16
Q9
Q6
Q7
Q8
R6 4.4K
Q5
R4 3K
Q4
Q17
D1
R3 6.8K
Q18
C1 5PF
Q2
Q3
R2 3K
Q1
R5 2.2K
3 INPUT
2 CURRENT OUT
1 CURRENT LIMITER
8 OUTPUT
7 COMPENSATION
6 ERROR DET.
5 REF. VOLTAGE
4 GND

μPC624C

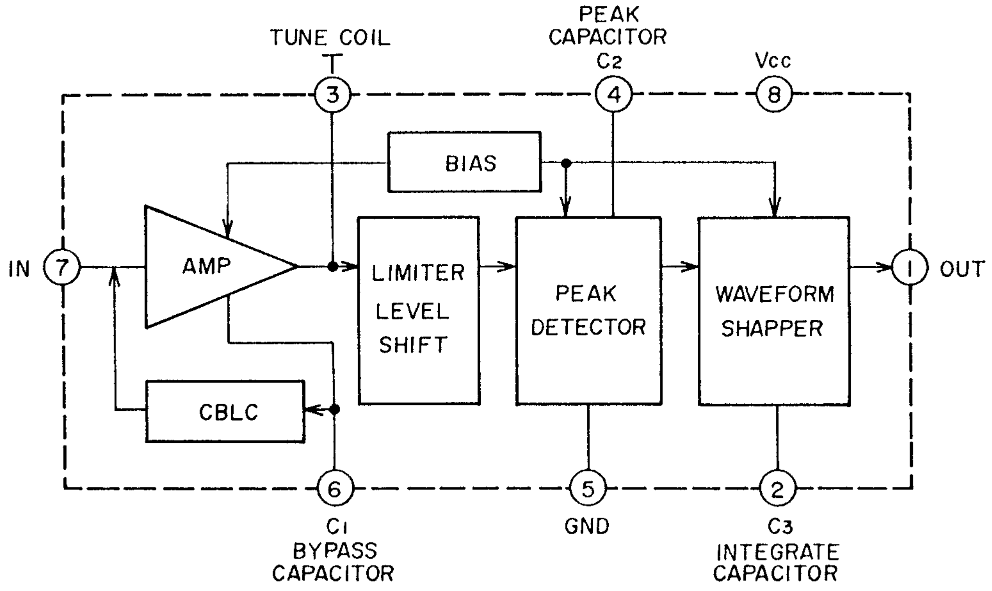

V+
out2
I I2
IN2
8
7
6
5
1
2
3
4
out1
I I1
IN2
V-

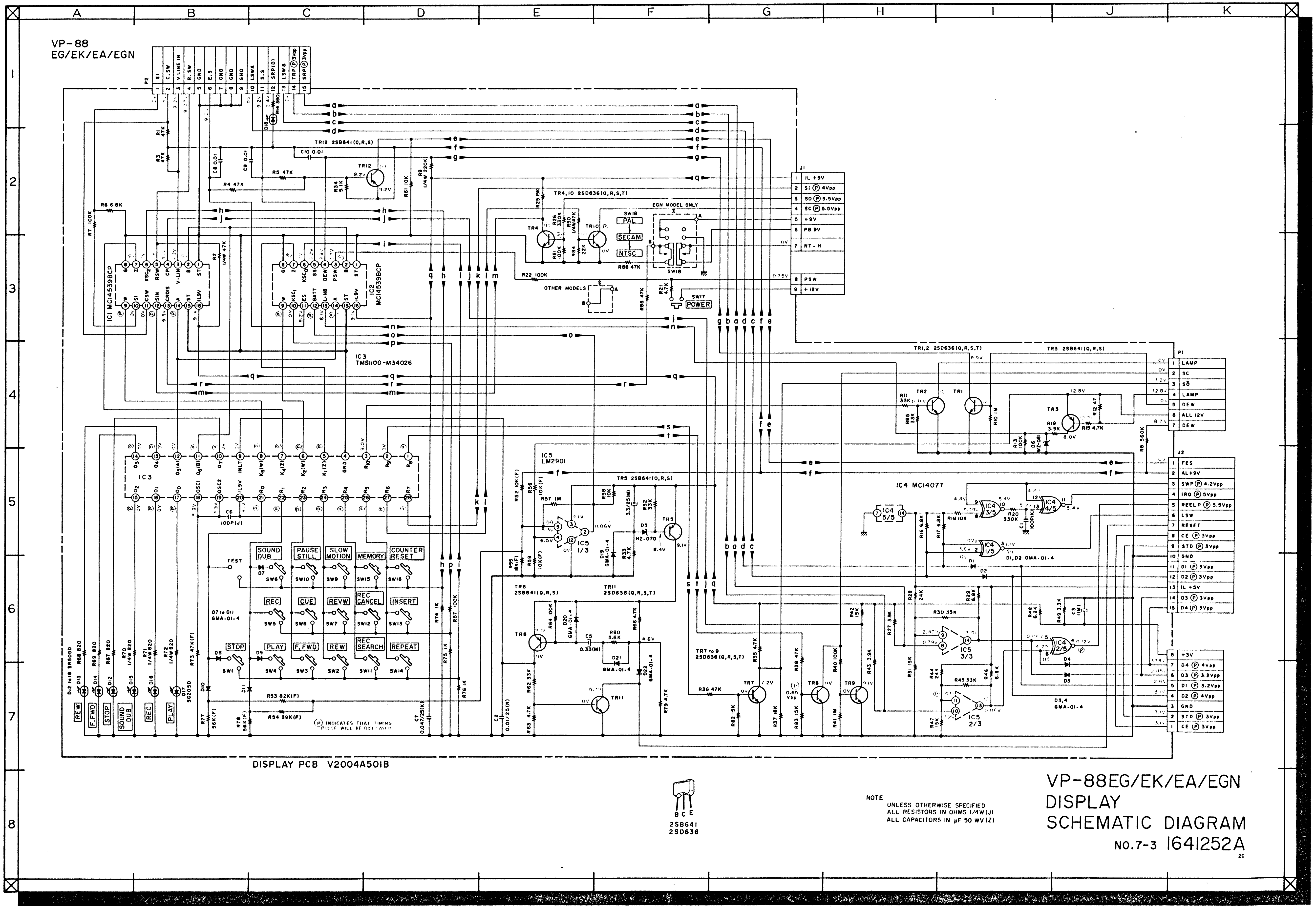
μPC1458C


MSB
A4
A3
A2
A1
Io
VEE
GND
RANGE CONTROL
8
7
6
5
4
3
2
1
9
10
11
12
13
14
15
16
A5
A6
A7
A8
VCC
VREF(+)
VREF(−)
COMPENSATION
LSB


MSB
A1
A2
A3
A4
A5
A6
A7
LSB
A8
5
6
7
8
9
10
11
12
RANGE CONTROL
1
CURRENT SWITCHES
4 Io
R-2R LADDER
BIAS CIRCUIT
2 GND
VREF(+) 14
VREF(−) 15
13 Vcc
REFERENCE CURRENT AMP
NPN CURRENT SOURCE PAIR
16 COMPENSATION
3
VEE

μPC1373H


TUNE COIL
PEAK CAPACITOR C2
Vcc
3
4
8
BIAS
IN 7
AMP
LIMITER LEVEL SHIFT
PEAK DETECTOR
WAVEFORM SHAPPER
1 OUT
CBLC
6
5
2
C1 BYPASS CAPACITOR
GND
C3 INTEGRATE CAPACITOR

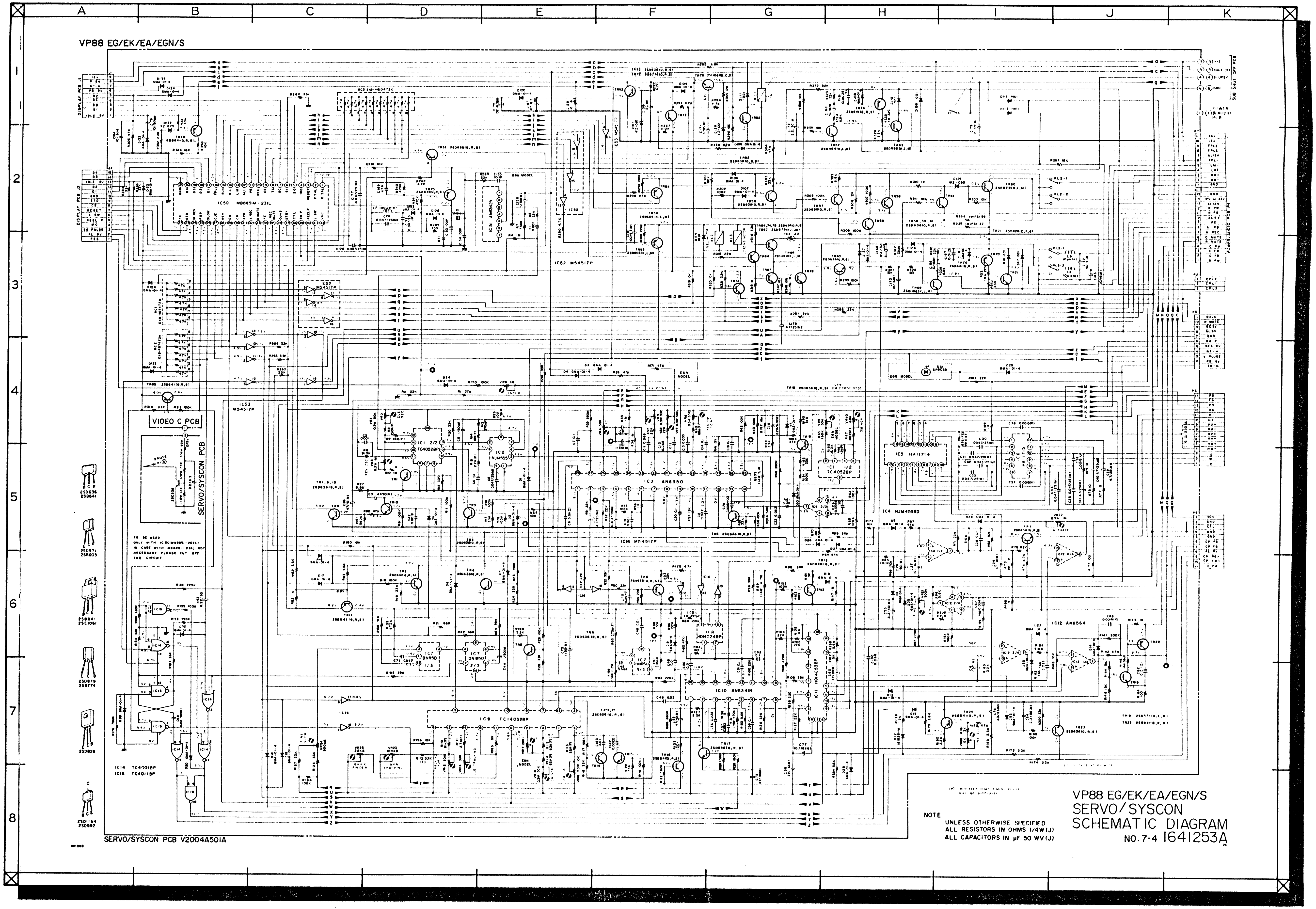

A
B
C
D
E
F
G
H
I
J
K
1
2
3
4
5
6
7
8
VP-88
EG/EK/EA/EGN
P2
1 SI
2 C.SW
3 V LINE IN
4 R.SW
5 GND
6 E.S
7 GND
8 GND
9 GND
10 LSWA
11 S.S
12 SRP(D)
13 LSW B
14 TRP (P) 3Vpp
15 SRP (P) 3Vpp
R14 390
D18
R1 47K
R3 47K
TR12 2SB641(Q,R,S)
C10 0.01
C8 0.01
C9 0.01
R5 47K
R4 47K
R34 5.1K
R61 10K
R9 1/4W 220K
R6 6.8K
R7 100K
R2 1/4W 47K
IC1 MC14539BCP
IC2 MC14539BCP
IC3 TMS1100-M34026
R25 15K
TR4,10 2SD636(Q,R,S,T)
TR4
TR10
R26 330K
R50 1/4W47K
R81 100K
R84 22K
EGN MODEL ONLY
SW18
PAL
SECAM
NTSC
R86 47K
R22 100K
OTHER MODELS
R88 47K
R21 4.7K
SW17
POWER
J1
1 IL +9V
2 Si (P) 4Vpp
3 SO (P) 5.5Vpp
4 SC (P) 5.5Vpp
5 +9V
6 PB 9V
7 NT-H
8 PSW
9 +12V
TR1,2 2SD636(Q,R,S,T)
TR3 2SB641(Q,R,S)
TR2
TR1
TR3
R11 33K
R85 33K
R10 1M
R13 100K
D6 WZ-081
R19 3.9K
R12 47
R15 4.7K
R8 560K
P1
1 LAMP
2 SC
3 SŌ
4 LAMP
5 DEW
6 ALL 12V
7 DEW
J2
1 FES
2 AL+9V
3 SWP (P) 4.2Vpp
4 IRQ (P) 5Vpp
5 REEL P (P) 5.5Vpp
6 LSW
7 RESET
8 CE (P) 3Vpp
9 STD (P) 3Vpp
10 GND
11 D1 (P) 3Vpp
12 D2 (P) 3Vpp
13 IL +5V
14 D3 (P) 3Vpp
15 D4 (P) 3Vpp
IC4 MC14077
IC4 5/5
IC4 3/5
IC4 4/5
IC4 1/5
IC4 2/5
R16 6.8K
R17 6.8K
R18 10K
R20 330K
C1 100P(K)
D1, D2 GMA-01-4
D1
D2
D3
D4
D3,4 GMA-01-4
R28 24K
R29 6.8K
R30 33K
R27 3.9K
R31 15K
IC5 3/3
IC5 2/3
R44 24K
R45 33K
R46 6.8K
R47 15K
R48 6.2K
R49 3.3K
C3 1(M)
8 +3V
7 D4 (P) 4Vpp
6 D3 (P) 3.2Vpp
5 D1 (P) 3.2Vpp
4 D2 (P) 4Vpp
3 GND
2 STD (P) 3Vpp
1 CE (P) 3Vpp
IC5 LM2901
IC5 1/3
TR5 2SB641(Q,R,S)
TR5
R52 10K(F)
R56 10K(F)
R57 1M
R58 10K
R32 33K
3.3/25(M)
D5 HZ-070
D19 GMA-01-4
R33 4.7K
R55 18K(F)
R59 10K(F)
TR6 2SB641(Q,R,S)
TR11 2SD636(Q,R,S,T)
TR6
TR11
R64 100K
D20 GMA-01-4
C5 0.33(M)
R80 5.6K
D21 GMA-01-4
D22 GMA-01-4
R65 4.7K
R62 33K
R63 4.7K
R79 4.7K
C2 0.01/25(N)
TR7 to 9 2SD636(Q,R,S,T)
TR7
TR8
TR9
R36 47K
R35 4.7K
R38 47K
R40 100K
R42 15K
R43 3.9K
R82 15K
R37 18K
R83 15K
R41 1M
IC3
C6 100P(J)
TEST
SOUND DUB
PAUSE STILL
SLOW MOTION
MEMORY
COUNTER RESET
REC
CUE
REVW
REC CANCEL
INSERT
STOP
PLAY
F.FWD
REW
REC SEARCH
REPEAT
SW1
SW2
SW3
SW4
SW5
SW6
SW7
SW8
SW9
SW10
SW11
SW12
SW13
SW14
SW15
SW16
D7
D8
D9
D10
D11
D7 to D11 GMA-01-4
R53 82K(F)
R54 39K(F)
R77 56K(F)
R78 56K(F)
C7 0.047/25(K)
R74 1K
R87 100K
R75 1K
R76 1K
(P) INDICATES THAT TIMING PULSE WILL BE DISPLAYED
D12 to 16 SR505D
D12
D13
D14
D15
D16
D17 SG205D
R68 820
R69 820
R67 820
R70 1/4W820
R71 1/4W820
R72 1/4W820
R73 47K(F)
REW
F.FWD
STOP
SOUND DUB
REC
PLAY
DISPLAY PCB V2004A501B
B C E
2SB641
2SD636

NOTE
UNLESS OTHERWISE SPECIFIED
ALL RESISTORS IN OHMS 1/4W(J)
ALL CAPACITORS IN μF 50 WV(Z)

VP-88EG/EK/EA/EGN
DISPLAY
SCHEMATIC DIAGRAM

NO.7-3 1641252A

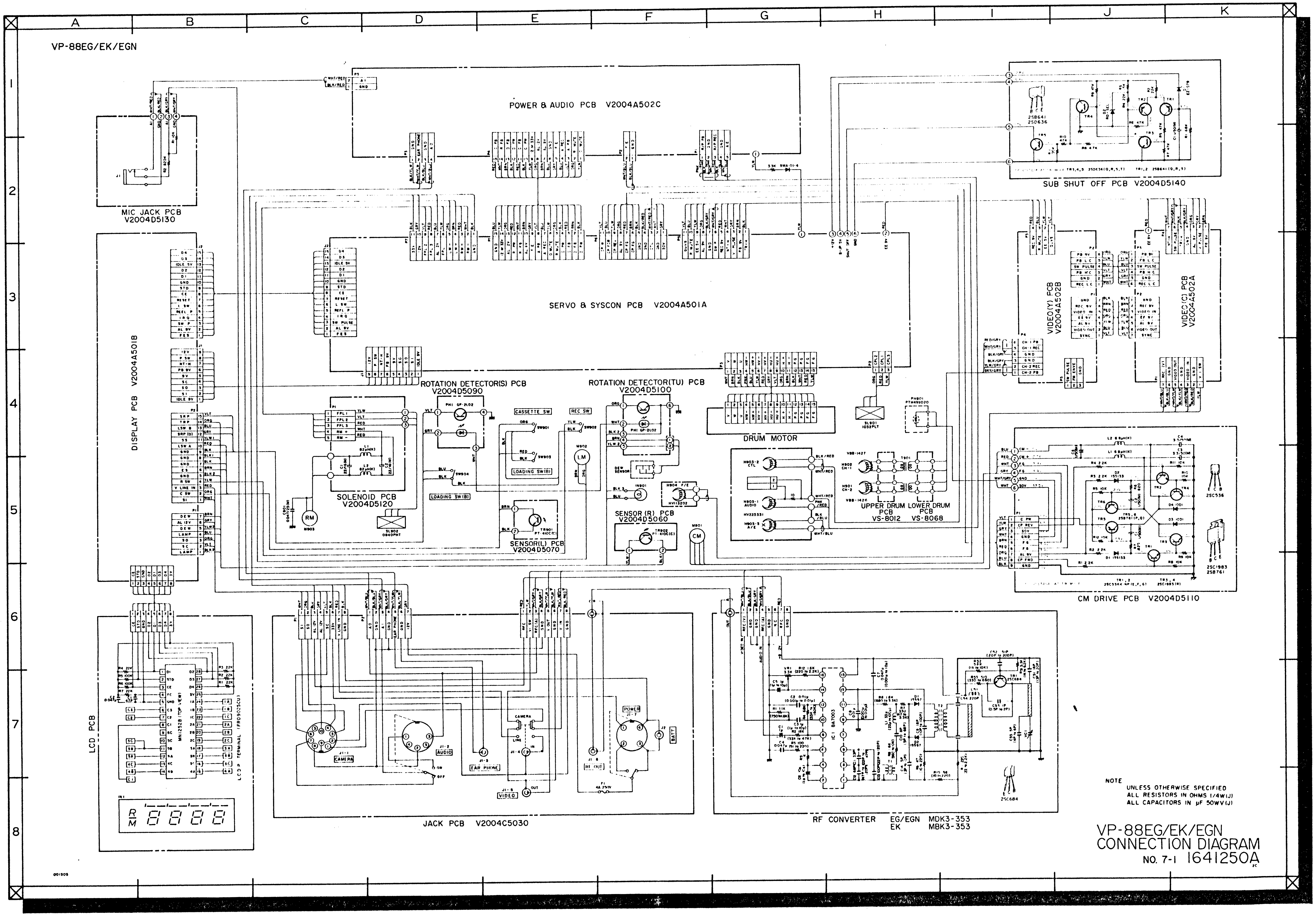
2C


A
B
C
D
E
F
G
H
I
J
K
1
2
3
4
5
6
7
8
VP88 EG/EK/EA/EGN/S
DISPLAY PCB J1
DISPLAY PCB J2
IC50 M58851M-231L
IC5 AN6342N
IC52 M54517P
IC53 M54517P
VIDEO C PCB
SERVO/SYSCON PCB
IC1 2/2 TC4052BP
IC2 NJM4558
IC3 AN6350
IC1 1/2 TC4052BP
IC5 HA11714
IC4 NJM4558D
IC16 M54517P
IC7 DN8501
IC8 MD4024BP
IC9 TC14052BP
IC10 AN6341N
IC11 MD4053BP
IC12 AN6564
IC14 TC4001BP
IC15 TC4011BP
2SD636
2SB641
2SD571
2SB605
2SB941
2SC1061
2SD879
2SB774
2SD826
2SD1164
2SD992
TO BE USED
ONLY WITH IC50(M58851-202L)
IN CASE WITH M58851-231L NOT
NECESSARY PLEASE CUT OFF
THE CIRCUIT
R188 220K
R155 100K
C43 0.22/50
SERVO/SYSCON PCB V2004A501A
R173 22K
R174 22K
R199 100K
VR26 10K
R180 2.2K
R183 3.3K

NOTE

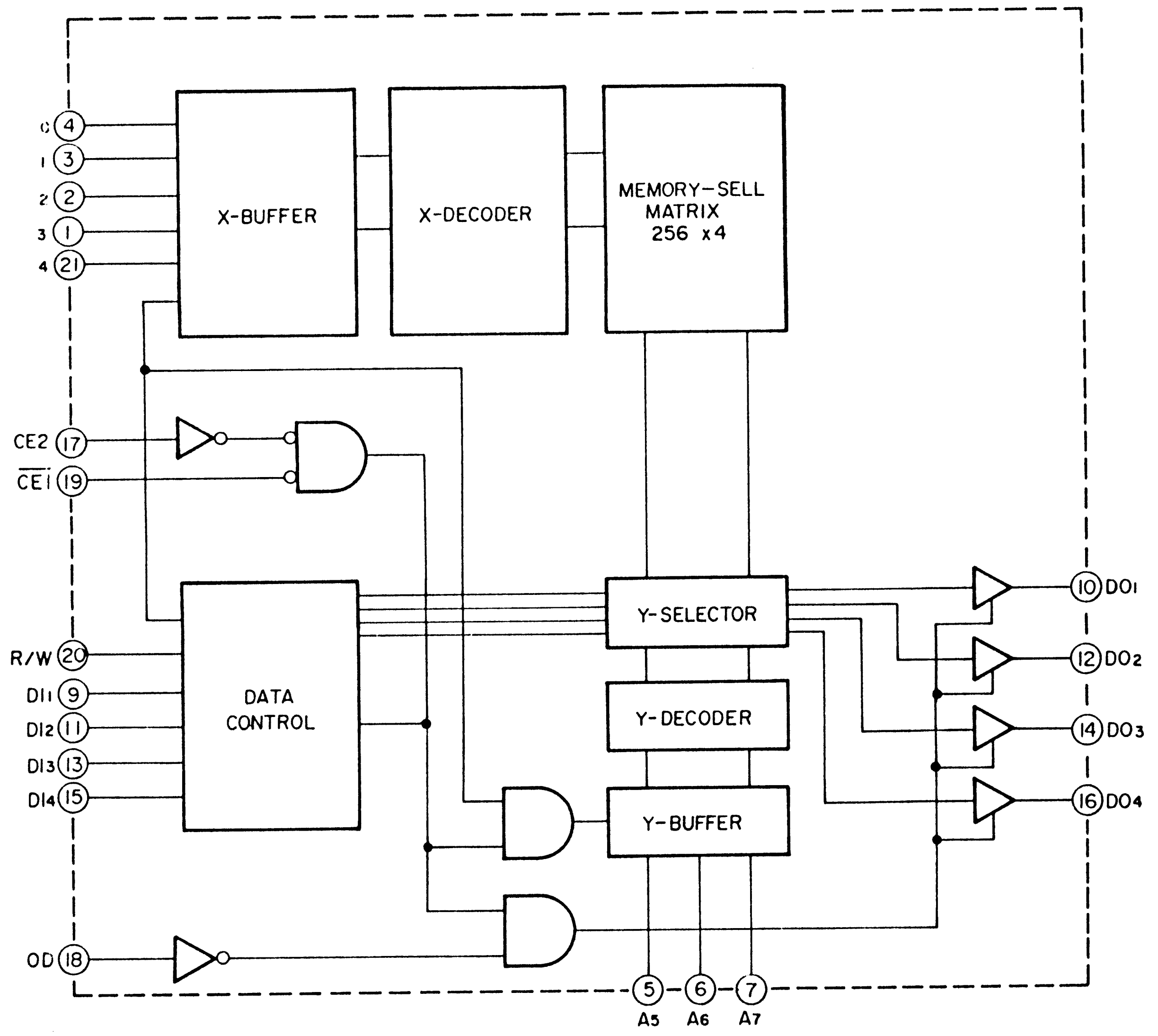
UNLESS OTHERWISE SPECIFIED
ALL RESISTORS IN OHMS 1/4W(J)
ALL CAPACITORS IN µF 50 WV(J)

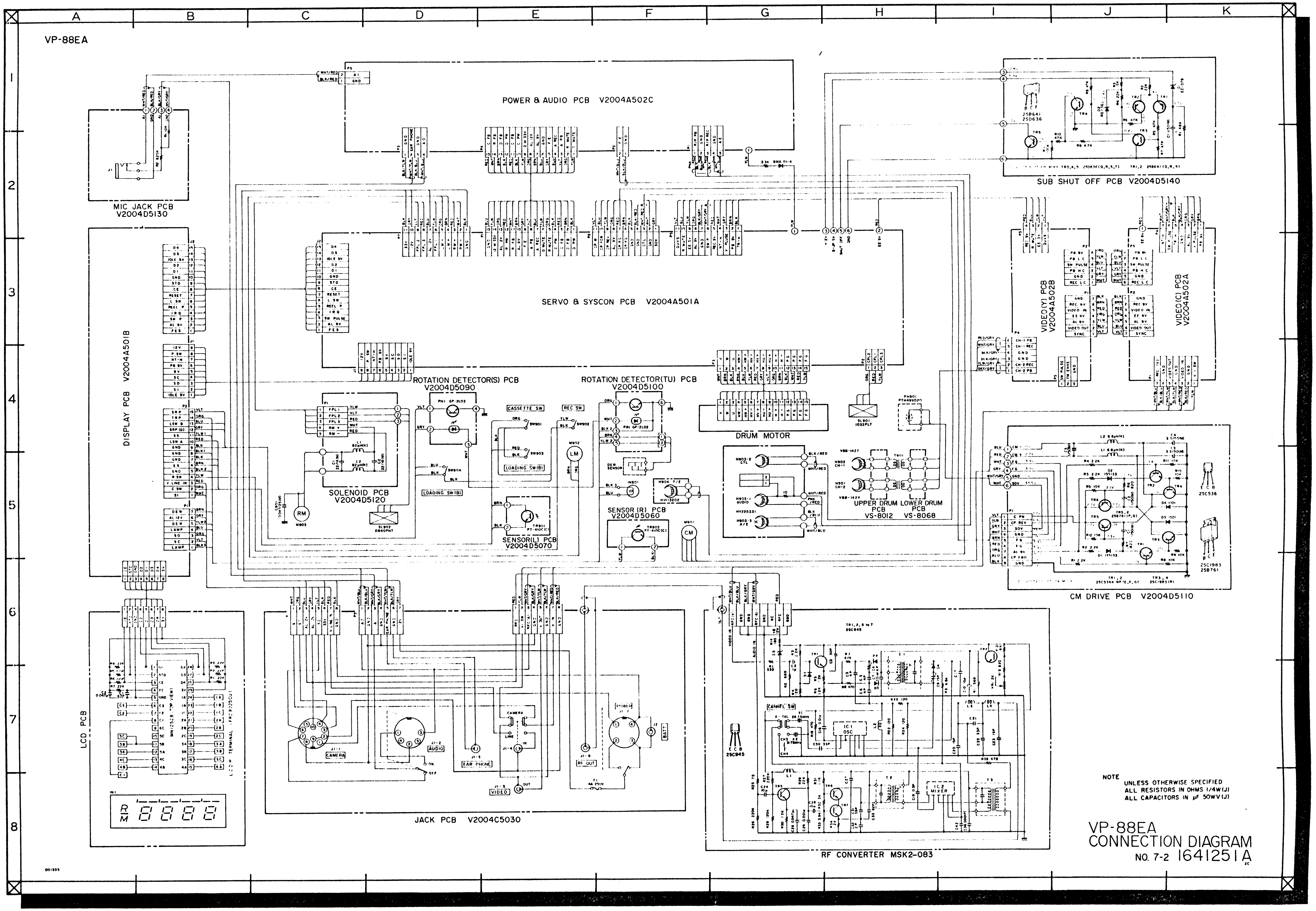
VP88 EG/EK/EA/EGN/S
SERVO/SYSCON
SCHEMATIC DIAGRAM
NO.7-4 1641253A


A
B
C
D
E
F
G
H
I
J
K
1
2
3
4
5
6
7
8
VP-88EG/EK/EGN
MIC JACK PCB
V2004D5130
POWER & AUDIO PCB V2004A502C
SUB SHUT OFF PCB V2004D5140
SERVO & SYSCON PCB V2004A501A
DISPLAY PCB V2004A501B
VIDEO(Y) PCB V2004A502B
VIDEO(C) PCB V2004A502A
ROTATION DETECTOR(S) PCB V2004D5090
ROTATION DETECTOR(TU) PCB V2004D5100
CASSETTE SW
REC SW
LOADING SW(B)
SOLENOID PCB V2004D5120
SENSOR(L) PCB V2004D5070
SENSOR (R) PCB V2004D5060
DRUM MOTOR
UPPER DRUM PCB VS-8012
LOWER DRUM PCB VS-8068
CM DRIVE PCB V2004D5110
LCD PCB
JACK PCB V2004C5030
RF CONVERTER EG/EGN MDK3-353
EK MBK3-353
CAMERA
AUDIO
EAR PHONE
VIDEO
POWER
BATT
RM
LM
CM
2SC536
2SC1983
2SB761
2SC684
2SB641
2SD636

NOTE
UNLESS OTHERWISE SPECIFIED
ALL RESISTORS IN OHMS 1/4W(J)
ALL CAPACITORS IN μF 50WV(J)

VP-88EG/EK/EGN
CONNECTION DIAGRAM
NO. 7-1 1641250A

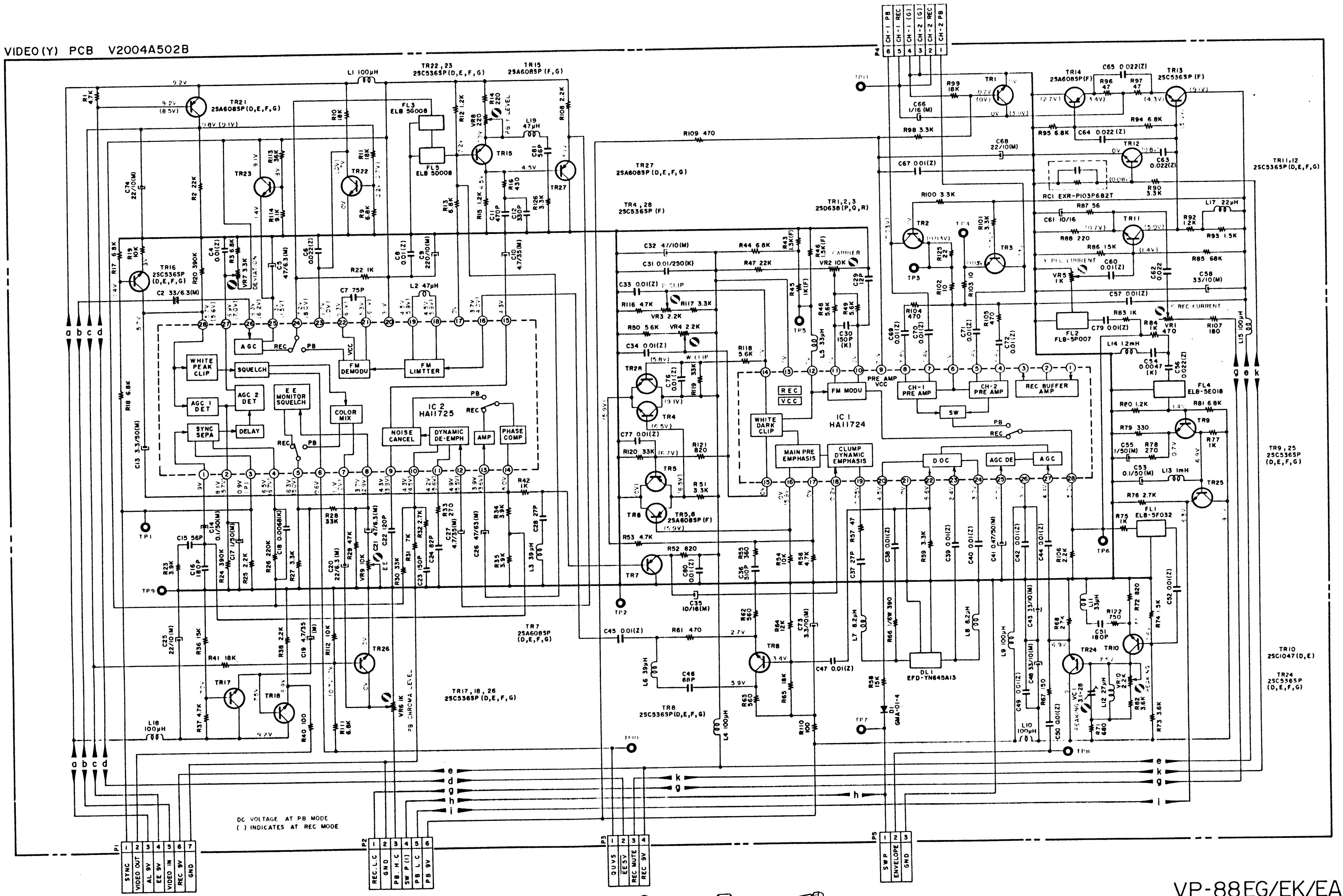

0 4
1 3
2 2
3 1
4 21
X-BUFFER
X-DECODER
MEMORY-SELL MATRIX 256 x4
CE2 17
CE1 19
R/W 20
DI1 9
DI2 11
DI3 13
DI4 15
DATA CONTROL
Y-SELECTOR
Y-DECODER
Y-BUFFER
OD 18
10 DO1
12 DO2
14 DO3
16 DO4
5 A5
6 A6
7 A7


A
B
C
D
E
F
G
H
I
J
K
1
2
3
4
5
6
7
8
VP-88EA
POWER & AUDIO PCB V2004A502C
MIC JACK PCB
V2004D5130
SUB SHUT OFF PCB V2004D5140
SERVO & SYSCON PCB V2004A501A
DISPLAY PCB V2004A501B
VIDEO(Y) PCB V2004A502B
VIDEO(C) PCB V2004A502A
ROTATION DETECTOR(S) PCB V2004D5090
ROTATION DETECTOR(TU) PCB V2004D5100
DRUM MOTOR
CASSETTE SW
REC SW
LOADING SW(B)
LOADING SW(B)
SOLENOID PCB V2004D5120
SENSOR(L) PCB V2004D5070
SENSOR (R) PCB V2004D5060
DEW SENSOR
UPPER DRUM PCB VS-8012
LOWER DRUM PCB VS-8068
CM DRIVE PCB V2004D5110
2SC536
2SC1983
2SB761
LCD PCB
JACK PCB V2004C5030
CAMERA
AUDIO
EAR PHONE
VIDEO
RF OUT
BATT
RF CONVERTER MSK2-083
2SC945
R/M
001305

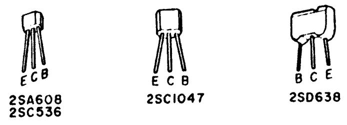
NOTE
UNLESS OTHERWISE SPECIFIED
ALL RESISTORS IN OHMS 1/4W(J)
ALL CAPACITORS IN μF 50WV(J)

VP-88EA
CONNECTION DIAGRAM
NO. 7-2 1641251A

VP-88EG/EK/EA/EGN


VIDEO(Y) PCB V2004A502B
IC 2 HA11725
IC 1 HA11724
AGC
WHITE PEAK CLIP
SQUELCH
AGC 1 DET
AGC 2 DET
E E MONITOR SQUELCH
SYNC SEPA
DELAY
COLOR MIX
FM DEMODU
FM LIMTTER
NOISE CANCEL
DYNAMIC DE-EMPH
AMP
PHASE COMP
REC
VCC
WHITE DARK CLIP
MAIN PRE EMPHASIS
CLUMP DYNAMIC EMPHASIS
FM MODU
CH-1 PRE AMP
CH-2 PRE AMP
REC BUFFER AMP
SW
DOC
AGC DE
PRE AMP VCC
TR21 2SA608SP(D,E,F,G)
TR22,23 2SC536SP(D,E,F,G)
TR15 2SA608SP(F,G)
TR27 2SA608SP(D,E,F,G)
TR4,28 2SC536SP(F)
TR1,2,3 2SD638(P,Q,R)
TR5,6 2SA608SP(F)
TR7 2SA608SP(D,E,F,G)
TR8 2SC536SP(D,E,F,G)
TR17,18,26 2SC536SP(D,E,F,G)
TR14 2SA608SP(F)
TR13 2SC536SP(F)
TR11,12 2SC536SP(D,E,F,G)
TR9,25 2SC536SP(D,E,F,G)
TR10 2SC1047(D,E)
TR24 2SC536SP(D,E,F,G)
FL1 ELB-5F032
FL2 FLB-5P007
FL3 ELB 5600B
FL4 ELB-5E018
FL5 ELB 5000B
DL1 EFD-YN645A13
D1 GMA01-4
RC1 EXR-P103P682T
P1: SYNC, VIDEO OUT, AL 9V, EE 9V, VIDEO IN, REC 9V, GND
P2: REC.L.C, GND, PB.H.C, SW P(I), PB L.C, PB 9V
P3: QUVS, EE5V, REC MUTE, REC 9V
P4: CH-1 PB, CH-1 REC, CH-1 (G), CH-2 (G), CH-2 REC, CH-2 PB
P5: SWP, ENVELOPE, GND
TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP9

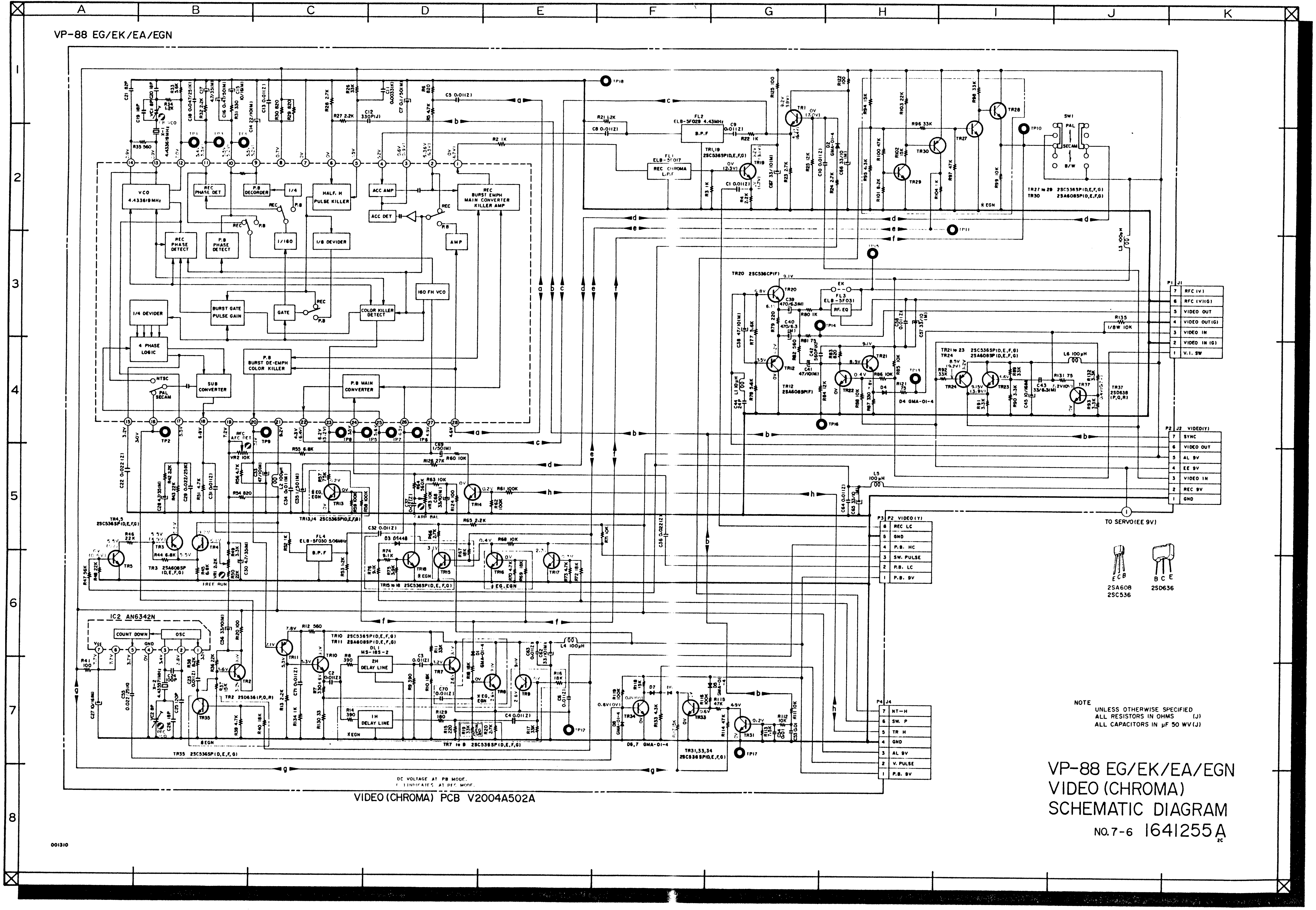
DC VOLTAGE AT PB MODE
( ) INDICATES AT REC MODE


E C B
2SA608
2SC536
E C B
2SC1047
B C E
2SD638

NOTE
UNLESS OTHERWISE SPECIFIED
ALL RESISTORS IN OHMS 1/4W(J)
ALL CAPACITORS IN μF 50 WV(J)

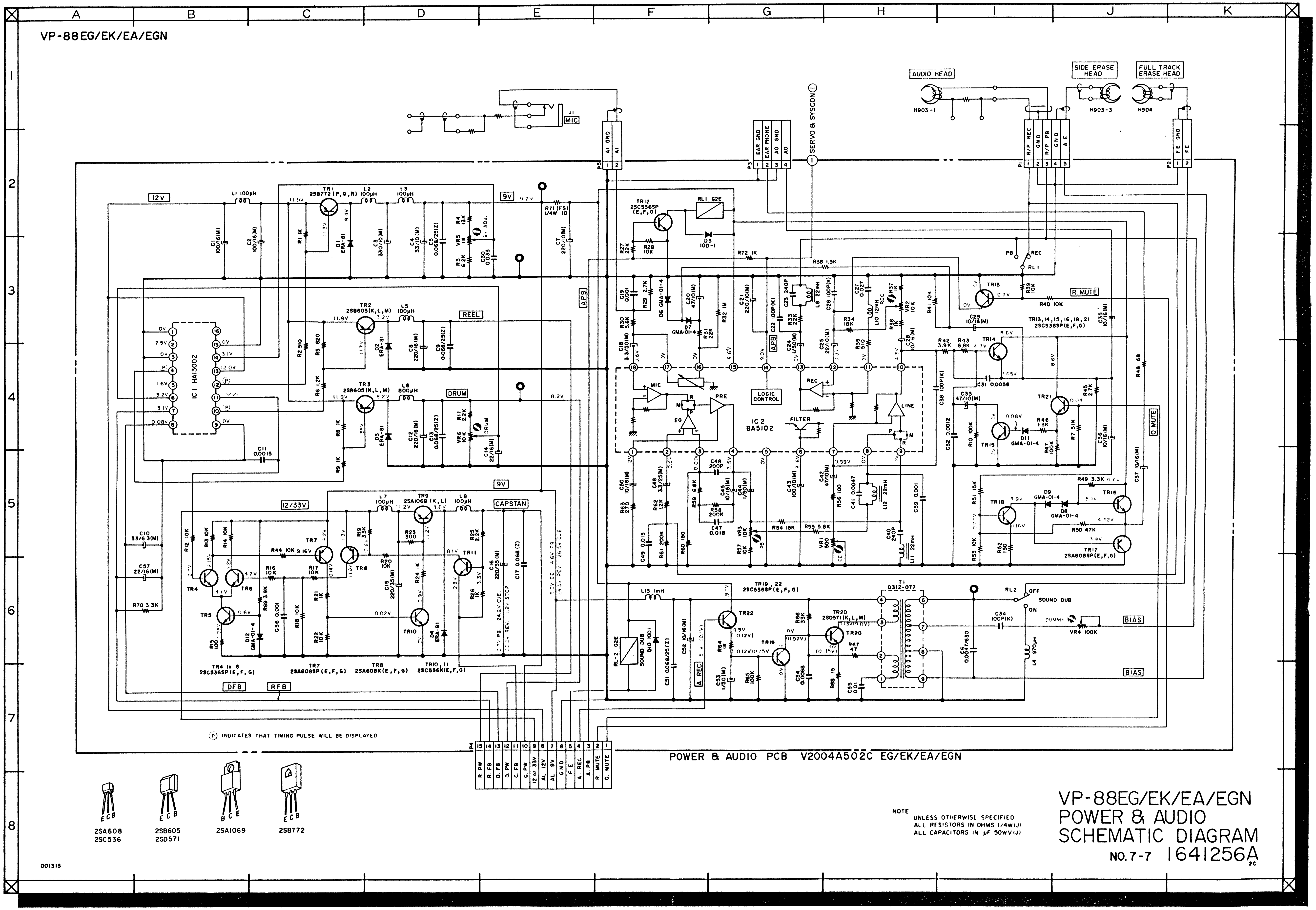
VP-88EG/EK/EA/EGN
VIDEO(Y)
SCHEMATIC DIAGRAM
NO. 7-5 1641254A 2c

001309


VP-88 EG/EK/EA/EGN
A
B
C
D
E
F
G
H
I
J
K
1
2
3
4
5
6
7
8
VCO 4.433619MHz
REC PHASE DET
P.B DECORDER
1/4
HALF. H PULSE KILLER
ACC AMP
ACC DET
REC BURST EMPH MAIN CONVERTER KILLER AMP
REC PHASE DETECT
P.B PHASE DETECT
1/160
1/8 DEVIDER
AMP
160 FH VCO
1/4 DEVIDER
BURST GATE PULSE GAIN
GATE
COLOR KILLER DETECT
4 PHASE LOGIC
P.B BURST DE-EMPH COLOR KILLER
NTSC
PAL SECAM
SUB CONVERTER
P.B MAIN CONVERTER
REC
P.B
TP1
TP2
TP3
TP4
TP5
TP6
TP7
TP8
TP9
TP10
TP11
TP12
TP13
TP14
TP15
TP16
TP17
TP18
FL1 ELB-5F017 REC CHROMA L.P.F
FL2 ELB-5F029 4.43MHz B.P.F
TR1,19 2SC536SP(D,E,F,G)
TR27 to 29 2SC536SP(D,E,F,G)
TR30 2SA608SP(D,E,F,G)
SW1 PAL SECAM B/W
TR20 2SC536CP(F)
FL3 ELB-5F031 RF. EQ
EK
TR12 2SA608SP(F)
D4 GMA-01-4
TR21 to 23 2SC536SP(D,E,F,G)
TR24 2SA608SP(D,E,F,G)
TR37 2SD638 (P,Q,R)
L6 100µH
R135 1/8W 10K
P1 J1
7 RFC (V)
6 RFC (V)(G)
5 VIDEO OUT
4 VIDEO OUT(G)
3 VIDEO IN
2 VIDEO IN (G)
1 V.I. SW
P2 J2 VIDEO(Y)
7 SYNC
6 VIDEO OUT
5 AL 9V
4 EE 9V
3 VIDEO IN
2 REC 9V
1 GND
TO SERVO(EE 9V)
P3 P2 VIDEO(Y)
6 REC LC
5 GND
4 P.B. HC
3 SW. PULSE
2 P.B. LC
1 P.B. 9V
E C B
2SA608
2SC536
B C E
2SD636
TR4,5 2SC536SP(D,E,F,G)
TR3 2SA608SP (D,E,F,G)
TR13,14 2SC536SP(D,E,F,G)
FL4 ELB-5F030 5.06MHz B.P.F
TR15 to 18 2SC536SP(D,E,F,G)
IC2 AN6342N
COUNT DOWN
OSC
TR2 2SD636(P,Q,R)
TR35 2SC536SP(D,E,F,G)
TR10 2SC536SP(D,E,F,G)
TR11 2SA608SP(D,E,F,G)
DL1 MS-185-2
2H DELAY LINE
1H DELAY LINE
TR7 to 9 2SC536SP(D,E,F,G)
D6,7 GMA-01-4
TR31,33,34 2SC536SP(D,E,F,G)
P4 J4
7 NT-H
6 SW. P
5 TR H
4 GND
3 AL 9V
2 V. PULSE
1 P.B. 9V
DC VOLTAGE AT PB MODE.
( ) INDICATES AT REC MODE.
VIDEO (CHROMA) PCB V2004A502A
001310

NOTE
UNLESS OTHERWISE SPECIFIED
ALL RESISTORS IN OHMS (J)
ALL CAPACITORS IN µF 50 WV(J)

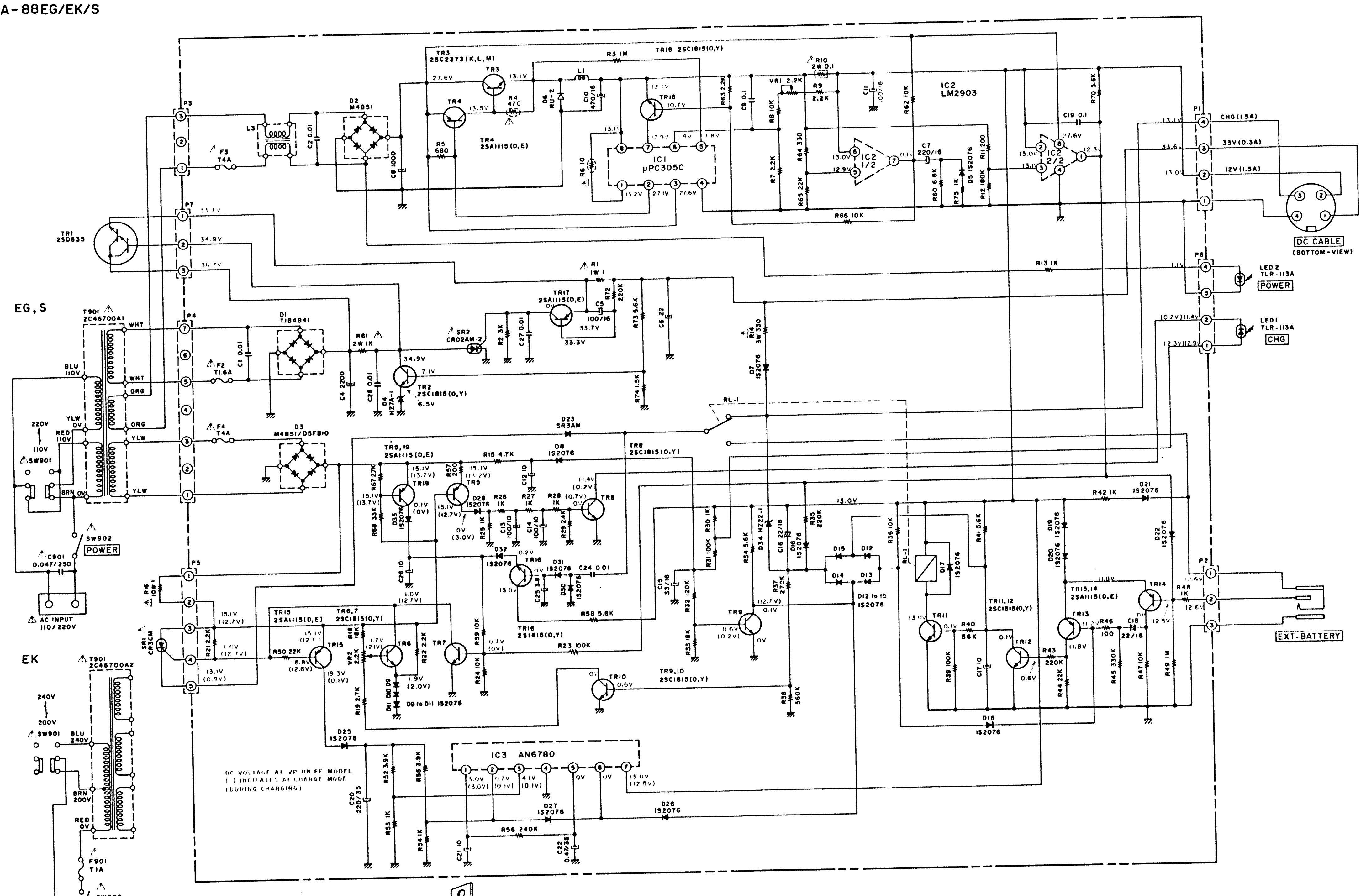
VP-88 EG/EK/EA/EGN
VIDEO (CHROMA)
SCHEMATIC DIAGRAM
NO.7-6 1641255A

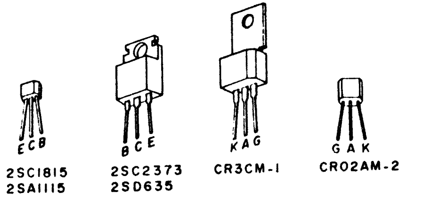

A
B
C
D
E
F
G
H
I
J
K
1
2
3
4
5
6
7
8
VP-88EG/EK/EA/EGN
J1 MIC
P5 AI GND AI
P3 EAR GND EAR PHONE AO GND AO
SERVO & SYSCON ①
AUDIO HEAD
H903-1
SIDE ERASE HEAD
H903-3
FULL TRACK ERASE HEAD
H904
P1 R/P REC GND R/P PB GND A.E
P2 GND F.E GND F.E
12V
L1 100μH
C1 100/16(M)
C2 100/16(M)
TR1 2SB772(P,Q,R)
L2 100μH
L3 100μH
R1 1K
D1 ERA-81
C3 330/10(M)
C4 33/10(M)
C5 0.068/25(Z)
VR5 1K
R3 6.2K
R4 13K
C30 0.033
9V
R71 (FS) 1/4W 10
C7 220/10(M)
TR2 2SB605(K,L,M)
L5 100μH
REEL
R2 510
R5 620
D2 ERA-81
C8 220/16(M)
C9 0.068/25(Z)
R6 1.2K
TR3 2SB605(K,L,M)
L6 800μH
DRUM
R8 1K
R9 1K
D3 ERA-81
C12 220/16(M)
C13 0.068/25(Z)
VR6 10K
R11 2.2K
C14 22/16(M)
IC1 HA13002
C11 0.0015
C10 33/6.3(M)
C57 22/16(M)
R70 3.3K
12/33V
L7 100μH
TR9 2SA1069(K,L)
L8 100μH
CAPSTAN
R12 10K
R13 10K
R14 10K
R44 10K
TR7
TR8
R19 3.3K
R23 300
TR11
R25 2.2K
C16 220/35(M)
C17 0.068(Z)
TR4
TR6
R16 10K
R17 10K
R20 10K
R24 1K
R26 1K
TR5
R69 3.9K
C56 0.001
R18 10K
R21 1K
C15 220/35(M)
TR10
D4 ERA-81
R15 100
D12 GMA-01-4
R22 10K
TR4 to 6 2SC536SP(E,F,G)
TR7 2SA608SP(E,F,G)
TR8 2SA608K(E,F,G)
TR10, 11 2SC536K(E,F,G)
DFB
RFB
(P) INDICATES THAT TIMING PULSE WILL BE DISPLAYED
APB
TR12 2SC536SP (E,F,G)
RL1 G2E
D5 10D-1
R27 22K
R28 10K
R72 1K
R38 1.5K
C19 0.001
R29 2.7K
D6 GMA-01-4
C20 47/10(M)
D7 GMA-01-4
R31 22K
R32 1M
C21 220/10(M)
C22 100P(K)
C23 240P
R33 22K
L9 22mH
C26 100P(K)
C27 0.027
VR3? REC
L10 12mH
R34 18K
R35 510
VR2 10K
R36 1K
C28 10/16(M)
R41 10K
C18 3.3/50(M)
R30 5.6K
C24 1/50(M)
C25 22/10(M)
MIC
PRE
EQ
LOGIC CONTROL
IC2 BA5102
FILTER
REC
LINE
PB
REC
RL1
TR13
R39 10K
R40 10K
R.MUTE
C29 10/16(M)
TR13, 14, 15, 16, 18, 21 2SC536SP(E,F,G)
C35 10/16(M)
R42 3.9K
R43 6.8K
TR14
C31 0.0056
C33 47/10(M)
C38 100P(K)
TR21
R45 2.7K
R48 68
R46 1.5K
D11 GMA-01-4
TR15
R10 100K
R47 100K
R7 51K
C36 10/16(M)
O.MUTE
C32 0.0012
C37 10/16(M)
C50 10/16(M)
C48 3.3/25(M)
C48 200P
C45 10/16(M)
C44 1/50(M)
R59 6.8K
R58 200K
C47 0.018
R63 270
R62 1.2K
C43 100/10(M)
C42 47/10(M)
R56 100
C41 0.0047
L12 22mH
C39 0.001
R51 15K
TR18
D9 GMA-01-4
D8 GMA-01-4
TR16
R49 3.3K
R50 47K
TR17 2SA608SP(E,F,G)
R53 10K
R52 150
C49 0.015
R61 200K
R60 180
R57 10K
VR3 10K
R54 15K
R55 5.6K
VR1 500
C40 240P
L11 22mH
TR19, 22 2SC536SP(E,F,G)
L13 1mH
T1 0312-077
RL2
OFF
SOUND DUB
ON
TR22
TR20 2SD571(K,L,M)
C34 100P(K)
VR4 100K
BIAS
RL-2 G2E
SOUND DUB
D10 10D1
C51 0.068/25(Z)
C52 10/16(M)
A.REC
R64 1K
C53 1/50(M)
R65 100K
TR19
C54 0.0068
R66 33K
R67 47
R68 15
C55 0.01
C6 0.0068/630
L4 970μH
BIAS
P4
R.PW
R.FB
D.FB
D.PW
C.FB
C.PW
12 or 33V
AL 12V
AL 9V
GND
F.E
A.REC
A.PB
R.MUTE
O.MUTE
POWER & AUDIO PCB V2004A502C EG/EK/EA/EGN
E C B
2SA608
2SC536
E C B
2SB605
2SD571
B C E
2SA1069
E C B
2SB772
001313

NOTE
UNLESS OTHERWISE SPECIFIED
ALL RESISTORS IN OHMS 1/4W(J)
ALL CAPACITORS IN μF 50WV(J)

VP-88EG/EK/EA/EGN
POWER & AUDIO
SCHEMATIC DIAGRAM

NO.7-7 1641256A


A
B
C
D
E
F
G
H
I
J
K
1
2
3
4
5
6
7
8
VA-88EG/EK/S
EG, S
EK
TR1 2SD635
T901 2C46700A1
T901 2C46700A2
SW901
SW902 POWER
C901 0.047/250
AC INPUT 110/220V
AC INPUT 200/240V
F901 T1A
F2 T1.6A
F3 T4A
F4 T4A
D1 T1B4B41
D2 M4B51
D3 M4B51/D5FB10
TR3 2SC2373(K,L,M)
TR4 2SA1115(D,E)
TR18 2SC1815(O,Y)
IC1 μPC305C
IC2 LM2903
IC3 AN6780
TR17 2SA1115(D,E)
TR2 2SC1815(O,Y)
TR5,19 2SA1115(D,E)
TR8 2SC1815(O,Y)
TR15 2SA1115(D,E)
TR6,7 2SC1815(O,Y)
TR16 2SI815(O,Y)
TR9,10 2SC1815(O,Y)
TR11,12 2SC1815(O,Y)
TR13,14 2SA1115(D,E)
RL-1
D23 SR3AM
SR1 CR3CM
SR2 CR02AM-2
D9 to D11 1S2076
D12 to 15 1S2076
P1
P2
P3
P4
P5
P6
P7
CHG (1.5A)
33V (0.3A)
12V (1.5A)
DC CABLE (BOTTOM-VIEW)
LED2 TLR-113A POWER
LED1 TLR-113A CHG
EXT-BATTERY
DC VOLTAGE AT VP-88EE MODEL
( ) INDICATES AT CHARGE MODE
(DURING CHARGING)


E C B
B C E
K A G
G A K
2SC1815
2SA1115
2SC2373
2SD635
CR3CM-1
CR02AM-2

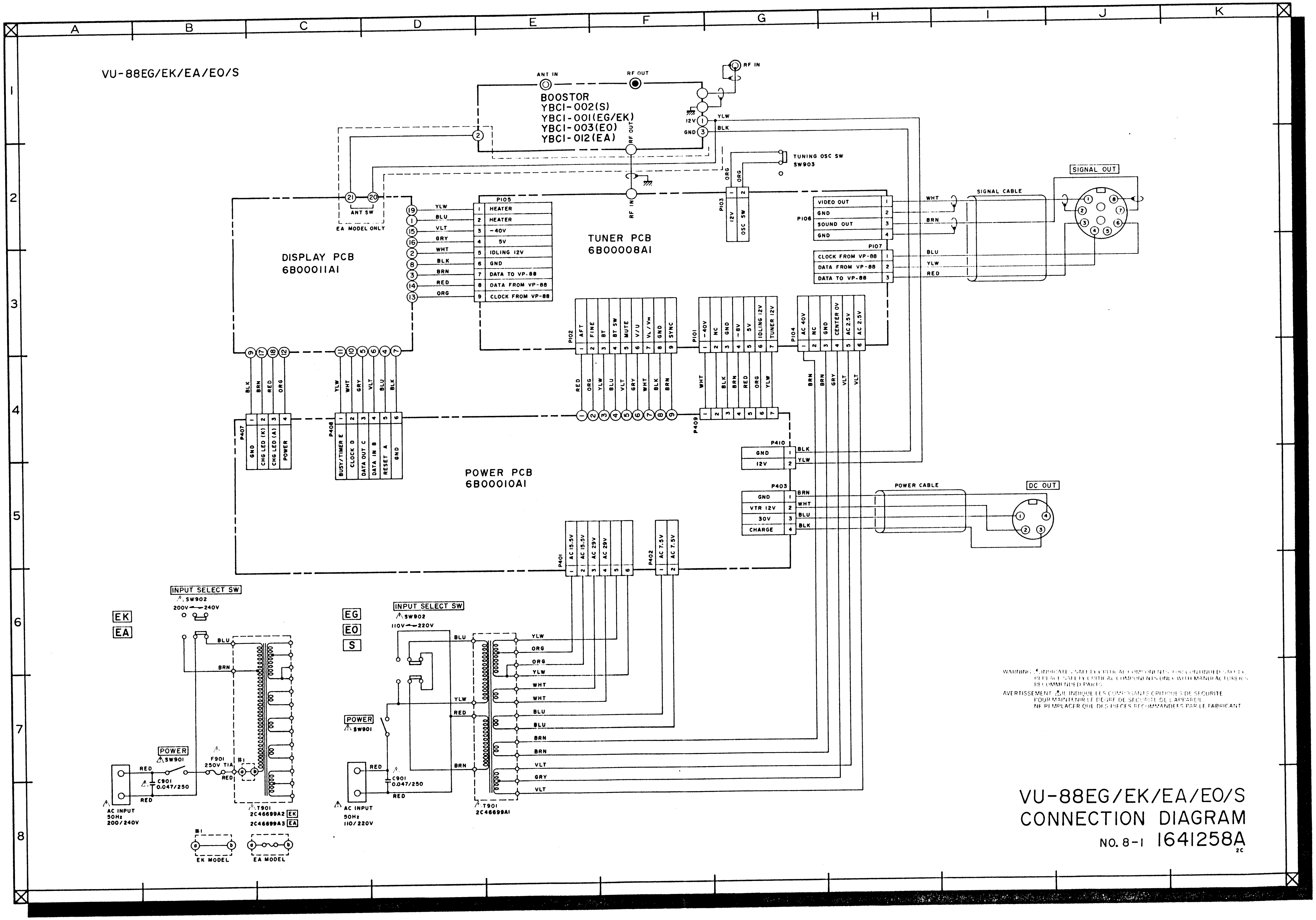
WARNING ⚠ INDICATES SAFETY CRITICAL COMPONENTS FOR CONTINUED SAFETY.
REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER'S
RECOMMENDED PARTS

AVERTISSEMENT ⚠ IL INDIQUE LES COMPOSANTS CRITIQUES DE SECURITE
POUR MAINTENIR LE DEGRE DE SECURITE DE L'APPAREIL,
NE REMPLACER QUE DES PIECES RECOMMANDEES PAR LE FABRICANT

NOTE
UNLESS OTHERWISE SPECIFIED
ALL RESISTORS IN OHMS 1/4W(J)
ALL CAPACITORS IN μF 50WV(J)

VA-88EG/EK/S
SCHEMATIC DIAGRAM
NO. 1641257A

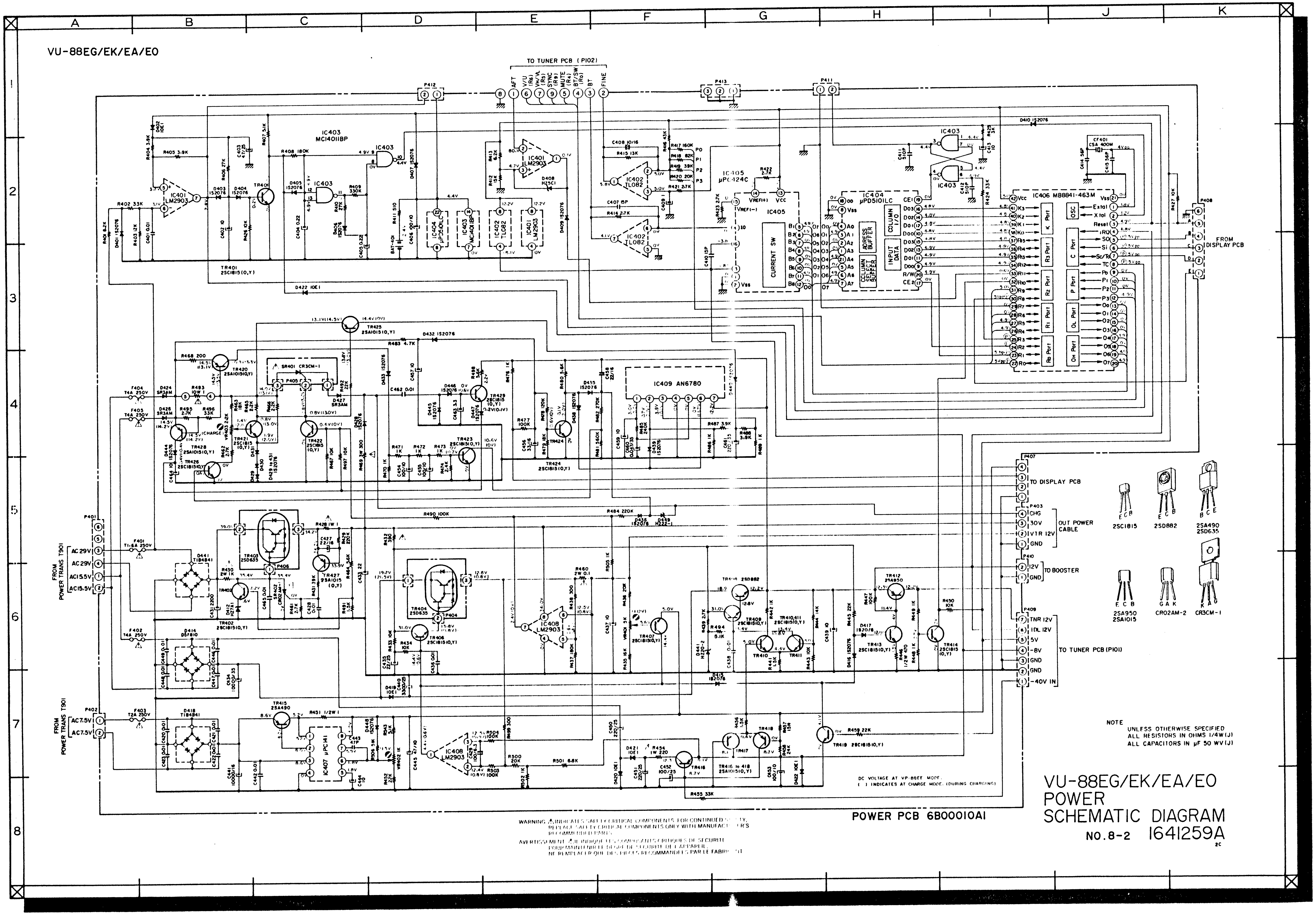
2C


VU-88EG/EK/EA/EO/S
ANT IN
RF OUT
RF IN
BOOSTOR
YBCI-002(S)
YBCI-001(EG/EK)
YBCI-003(EO)
YBCI-012(EA)
12V
GND
YLW
BLK
TUNING OSC SW
SW903
ANT SW
EA MODEL ONLY
DISPLAY PCB
6B00011A1
TUNER PCB
6B00008A1
POWER PCB
6B00010A1
P105
HEATER
HEATER
-40V
5V
IDLING 12V
GND
DATA TO VP-88
DATA FROM VP-88
CLOCK FROM VP-88
P103
12V
OSC SW
ORG
P106
VIDEO OUT
GND
SOUND OUT
GND
P107
CLOCK FROM VP-88
DATA FROM VP-88
DATA TO VP-88
SIGNAL CABLE
SIGNAL OUT
WHT
BRN
BLU
YLW
RED
P102
AFT
FINE
BT
BT SW
MUTE
V/U
VL/VH
GND
SYNC
P101
-40V
NC
GND
-8V
5V
IDLING 12V
TUNER 12V
P104
AC 40V
NC
GND
CENTER 0V
AC 2.5V
AC 2.5V
P407
GND
CHG LED (K)
CHG LED (A)
POWER
P408
BUSY/TIMER E
CLOCK D
DATA OUT C
DATA IN B
RESET A
GND
P409
P410
GND
12V
P403
GND
VTR 12V
30V
CHARGE
POWER CABLE
DC OUT
P401
AC 15.5V
AC 15.5V
AC 29V
AC 29V
P402
AC 7.5V
AC 7.5V
EK
EA
INPUT SELECT SW
SW902
200V——240V
POWER
SW901
F901
250V T1A
#1
C901
0.047/250
AC INPUT
50Hz
200/240V
T901
2C46699A2 EK
2C46699A3 EA
EK MODEL
EA MODEL
EG
EO
S
INPUT SELECT SW
SW902
110V——220V
POWER
SW901
C901
0.047/250
AC INPUT
50Hz
110/220V
T901
2C46699A1
ORG
GRY
VLT
A B C D E F G H I J K
1 2 3 4 5 6 7 8

WARNING: ⚠ INDICATES SAFETY CRITICAL COMPONENTS. FOR CONTINUED SAFETY, REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER'S RECOMMENDED PARTS.

AVERTISSEMENT: ⚠ IL INDIQUE LES COMPOSANTS CRITIQUES DE SECURITE POUR MAINTENIR LE DEGRE DE SECURITE DE L'APPAREIL. NE REMPLACER QUE DES PIECES RECOMMANDEES PAR LE FABRICANT.

VU-88EG/EK/EA/EO/S
CONNECTION DIAGRAM
NO. 8-1 1641258A
2C


A
B
C
D
E
F
G
H
I
J
K
1
2
3
4
5
6
7
8
VU-88EG/EK/EA/EO
TO TUNER PCB (P102)
AFT
V/U (R6)
VH/VL (R5)
SYNC (R9)
MUTE (R4)
BT/SW (Ro)
BT
FINE
P412
P413
P411
IC403 MC14011BP
IC401 LM2903
IC402 TL082
IC405 μPC124C
IC404 μPD5101LC
IC406 MB8841-463M
IC409 AN6780
IC408 LM2903
IC407 μPC141
CURRENT SW
INPUT DATA
COLUMN I/O
ADRESS BUFFER
COLUMN SELECT BUFFER
K Port
R3 Port
R2 Port
R1 Port
R0 Port
OSC
C Port
P Port
OL Port
OH Port
FROM DISPLAY PCB
P408
P407
TO DISPLAY PCB
P403
CHG
30V
VTR 12V
GND
OUT POWER CABLE
P410
12V
GND
TO BOOSTER
P409
TNR 12V
IDL 12V
5V
-8V
GND
GND
-40V IN
TO TUNER PCB (P101)
P401
AC29V
AC29V
AC15.5V
AC15.5V
FROM POWER TRANS T901
P402
AC7.5V
AC7.5V
FROM POWER TRANS T901
F401 T1.6A 250V
F402 T4A 250V
F403 T2A 250V
F404 T4A 250V
F405 T4A 250V
D441 T1B4B41
D414 D5FB10
D418 T1B4B41
SR401 CR3CM-1
TR403 2SD635
TR404 2SD635
TR425 2SA1015(O,Y)
TR412 2SA950
TR410 2SD882
TR419 2SC1815(O,Y)
2SC1815
2SD882
2SA490
2SD635
2SA950
2SA1015
CR02AM-2
CR3CM-1
E C B
G A K
K A G
B C E

NOTE
UNLESS OTHERWISE SPECIFIED
ALL RESISTORS IN OHMS 1/4W(J)
ALL CAPACITORS IN μF 50 WV(J)

DC VOLTAGE AT VP-88EE MODE.
( ) INDICATES AT CHARGE MODE. (DURING CHARGING)

POWER PCB 6B00010A1

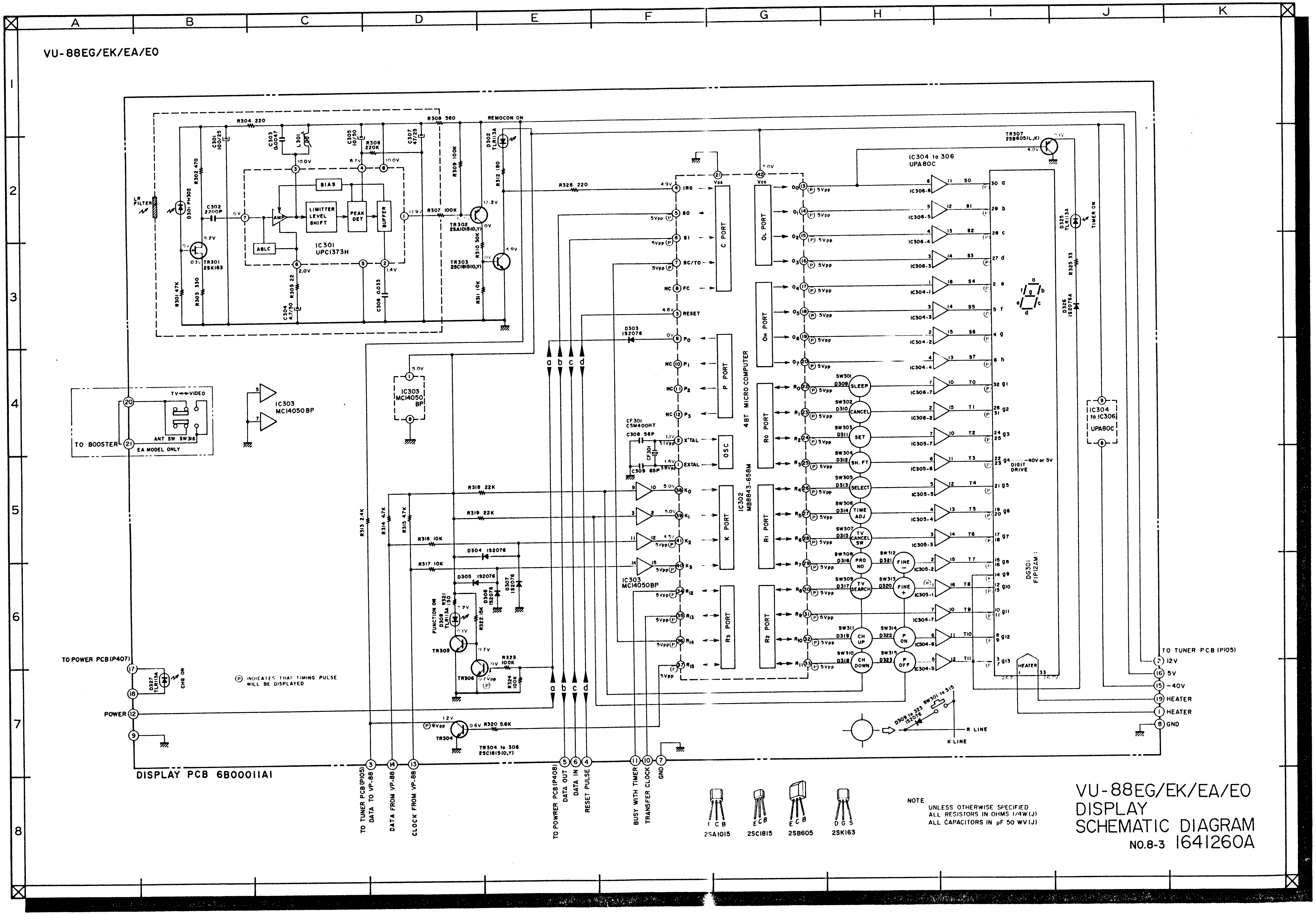
WARNING ⚠ INDICATES SAFETY CRITICAL COMPONENTS FOR CONTINUED SAFETY.
REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER'S
RECOMMENDED PARTS.

AVERTISSEMENT ⚠ IL INDIQUE LES COMPOSANTES CRITIQUES DE SECURITE
POUR MAINTENIR LE DEGRE DE SECURITE DE L'APPAREIL.
NE REMPLACER QUE DES PIECES RECOMMANDEES PAR LE FABRICANT

VU-88EG/EK/EA/EO
POWER
SCHEMATIC DIAGRAM

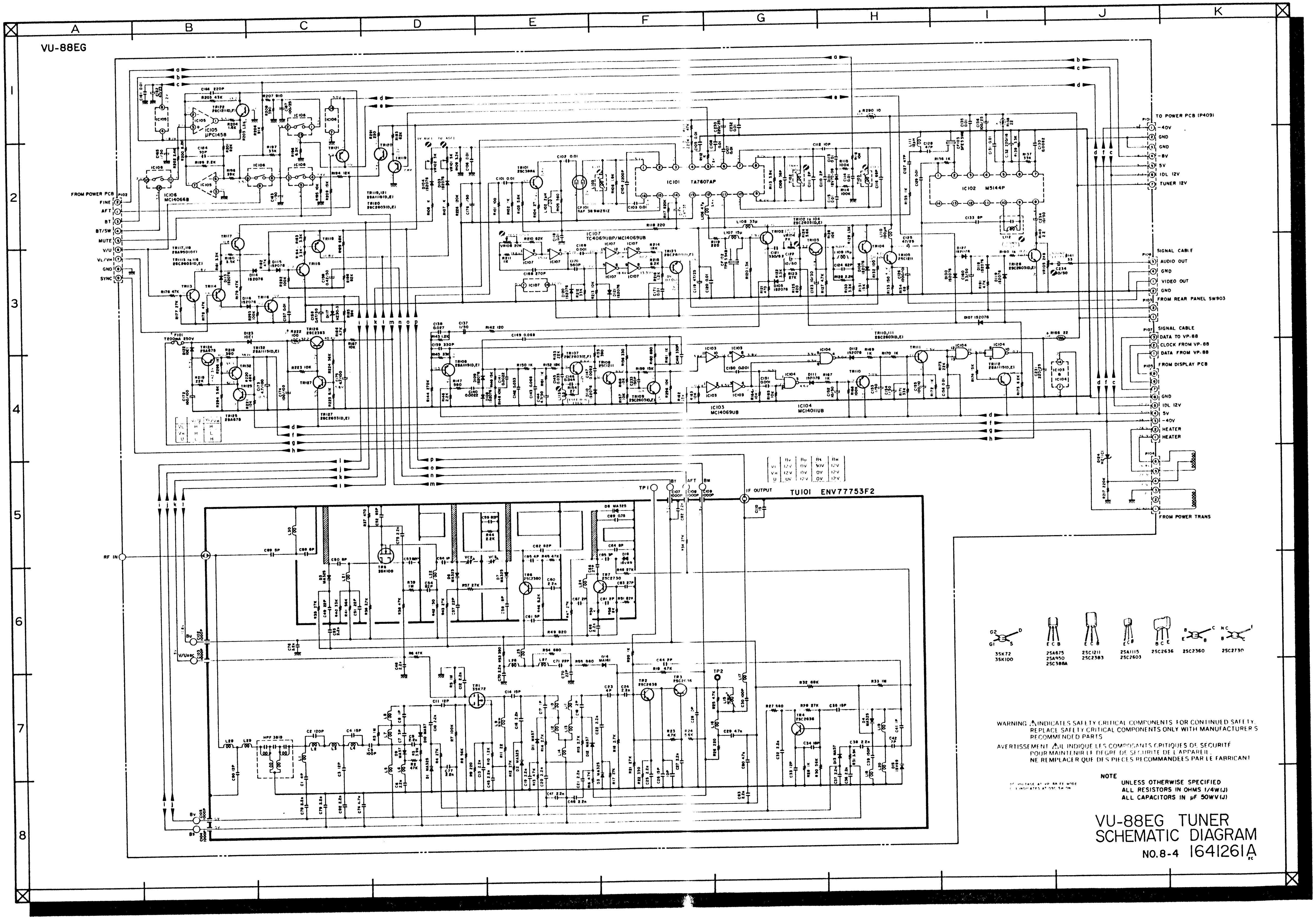
NO.8-2 1641259A

2C


A
B
C
D
E
F
G
H
I
J
K
1
2
3
4
5
6
7
8
VU-88EG/EK/EA/EO
LR FILTER
D301 PH302
C302 2200P
TR301 2SK163
R301 47K
R303 330
R302 470
C301 100/25
R304 220
C303 0.0047
L301
C305 10/50
R306 220K
C307 47/25
R308 560
BIAS
LIMITTER LEVEL SHIFT
PEAK DET
BUFFER
AMP
ABLC
IC301 UPC1373H
C304 4.7/50
R305 22
C306 0.033
R309 100K
R307 100K
TR302 2SA1015(O,Y)
TR303 2SC1815(O,Y)
R310 30K
R311 10K
REMOCON ON
D302 TLR113A
R312 180
R326 220
IRQ
S0
S1
SC/TO
FC
RESET
Vss
Vcc
C PORT
D303 1S2076
P0
P1
P2
P3
P PORT
CF301 CSM400HT
C308 56P
C309 68P
X'TAL
EXTAL
OSC
K0
K1
K2
K3
K PORT
R12
R13
R14
R15
R3 PORT
4BT MICRO COMPUTER
IC302 MB8843-656M
O0
O1
O2
O3
OL PORT
O4
O5
O6
O7
OH PORT
R0
R1
R2
R3
R0 PORT
R4
R5
R6
R7
R1 PORT
R8
R9
R10
R11
R2 PORT
5Vpp
IC304 to 306 UPA80C
TR307 2SB605(L,K)
SW301 D309 SLEEP
SW302 D310 CANCEL
SW303 D311 SET
SW304 D312 SH. FT
SW305 D313 SELECT
SW306 D314 TIME ADJ
SW307 D315 TV CANCEL SW
SW308 D316 PRO NO
SW312 D321 FINE −
SW309 D317 TV SEARCH
SW313 D320 FINE +
SW311 D319 CH UP
SW314 D322 P ON
SW310 D318 CH DOWN
SW315 D323 P OFF
DG301 FIP12AM1
DIGIT DRIVE
−40V or 5V
HEATER
D325 TLR113A
TIMER ON
R325 33
D326 1S2076A
IC304 to IC306 UPA80C
IC303 MC14050BP
TO BOOSTER
TV↔VIDEO
ANT SW SW316
EA MODEL ONLY
R318 22K
R319 22K
R316 10K
R317 10K
D304 1S2076
D305 1S2076
D306 1S2076
D307 1S2076
FUNCTION ON D328 TLR113A
R321 150
R322 15K
TR305
TR306
R323 100K
R324 100K
R313 2.4K
R314 4.7K
R315 4.7K
TO POWER PCB (P407)
D327 TLR113A
CHB ON
POWER
(P) INDICATES THAT TIMING PULSE WILL BE DISPLAYED
TR304
R320 5.6K
TR304 to 306 2SC1815(O,Y)
DISPLAY PCB 6B00011A1
TO TUNER PCB (P105) DATA TO VP-88
DATA FROM VP-88
CLOCK FROM VP-88
TO POWRER PCB (P408) DATA OUT
DATA IN
RESET PULSE
BUSY WITH TIMER
TRANSFER CLOCK
GND
TO TUNER PCB (P105)
12V
5V
−40V
HEATER
HEATER
GND
D309 to 323 1S2076
SW301 to 315
R LINE
K LINE
E C B
2SA1015
2SC1815
2SB605
D G S
2SK163

NOTE
UNLESS OTHERWISE SPECIFIED
ALL RESISTORS IN OHMS 1/4W (J)
ALL CAPACITORS IN μF 50 WV (J)

VU-88EG/EK/EA/EO
DISPLAY
SCHEMATIC DIAGRAM
NO.8-3 1641260A


A
B
C
D
E
F
G
H
I
J
K
1
2
3
4
5
6
7
8
VU-88EG
FROM POWER PCB
P102
FINE
AFT
BT
BT/SW
MUTE
V/U
VL/VH
GND
SYNC
IC105 μPC1458
IC106 MC14066B
IC101 TA7607AP
IC102 M5144P
IC107 TC4069UBP/MC14069UB
IC103 MC14069UB
IC104 MC14011UB
CF101 SAF 38.9MZ612
TU101 ENV77753F2
RF IN
IF OUTPUT
TP1
TP2
AFT
Bv
V/U
BU
TO POWER PCB (P409)
P101
-40V
GND
GND
-8V
5V
IDL 12V
TUNER 12V
SIGNAL CABLE
P106
AUDIO OUT
GND
VIDEO OUT
GND
P103
FROM REAR PANEL SW903
P107
SIGNAL CABLE
DATA TO VP-88
CLOCK FROM VP-88
DATA FROM VP-88
P105
FROM DISPLAY PCB
GND
IDL 12V
5V
-40V
HEATER
HEATER
P104
FROM POWER TRANS
G2
D
G1
S
3SK72
3SK100
E C B
2SA675
2SA950
2SC388A
E C B
2SC1211
2SC2383
E C B
2SA1115
2SC2603
B C E
2SC2636
B
C
E
B
2SC2360
N C
E
B
C
2SC2730

WARNING ⚠ INDICATES SAFETY CRITICAL COMPONENTS FOR CONTINUED SAFETY.
REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER'S
RECOMMENDED PARTS

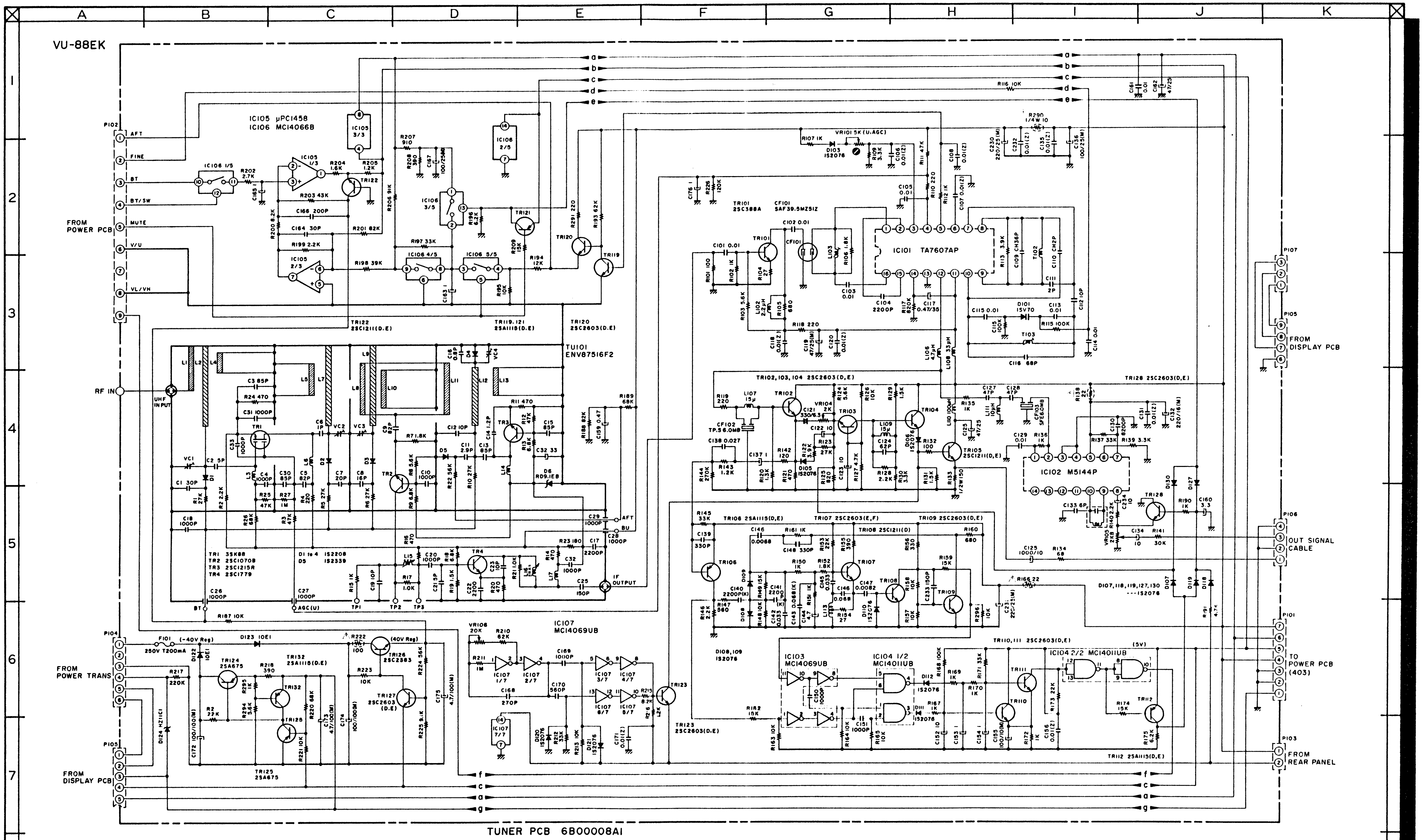
AVERTISSEMENT ⚠ IL INDIQUE LES COMPOSANTS CRITIQUES DE SÉCURITÉ
POUR MAINTENIR LE DEGRÉ DE SÉCURITÉ DE L'APPAREIL.
NE REMPLACER QUE DES PIECES RECOMMANDEES PAR LE FABRICANT

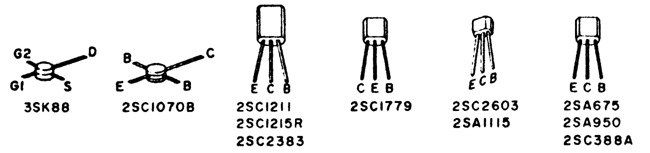
DC VOLTAGE AT VP-88 FF MODE
( ) INDICATES AT OSC SW ON

NOTE
UNLESS OTHERWISE SPECIFIED
ALL RESISTORS IN OHMS 1/4W(J)
ALL CAPACITORS IN μF 50WV(J)

VU-88EG TUNER SCHEMATIC DIAGRAM

NO.8-4 1641261A


VU-88EK
A
B
C
D
E
F
G
H
I
J
K
P102
AFT
FINE
BT
BT/SW
MUTE
V/U
VL/VH
FROM POWER PCB
IC105 μPC1458
IC106 MC14066B
TRI22 2SC1211(D.E)
TRI19, 121 2SA1115(D.E)
TR120 2SC2603(D.E)
TU101 ENV87516F2
RF IN
UHF INPUT
TR1 3SK88
TR2 2SC1070B
TR3 2SC1215R
TR4 2SC1779
D1 to 4 1S2208
D5 1S2339
AFT
BU
IF OUTPUT
TP1
TP2
TP3
AGC(U)
TR101 2SC388A
CF101 SAF39.5MZ51Z
IC101 TA7607AP
VR101 5K (U.AGC)
TR102, 103, 104 2SC2603(D,E)
TR105 2SC1211(D,E)
TR128 2SC2603(D.E)
IC102 M5144P
TR106 2SA1115(D,E)
TR107 2SC2603(E,F)
TR108 2SC1211(D)
TR109 2SC2603(D,E)
D107, 118, 119, 127, 130 ---1S2076
P107
P105
FROM DISPLAY PCB
P106
OUT SIGNAL CABLE
P101
TO POWER PCB (403)
P103
FROM REAR PANEL
P104
FROM POWER TRANS
F101 250V T200mA
(-40V Reg)
(40V Reg)
D123 10E1
TR124 2SA675
TR132 2SA1115(D.E)
TR126 2SC2383
TR127 2SC2603 (D.E)
TR125 2SA675
IC107 MC14069UB
TR123 2SC2603(D.E)
IC103 MC14069UB
IC104 1/2 MC14011UB
IC104 2/2 MC14011UB
TR110, 111 2SC2603(D,E)
TR112 2SA1115(D.E)
(5V)
P105
FROM DISPLAY PCB
a
b
c
d
e
f
g
TUNER PCB 6B00008A1


G2
D
G1
S
3SK88
C
E
B
2SC1070B
E C B
2SC1211
2SC1215R
2SC2383
C E B
2SC1779
E C B
2SC2603
2SA1115
E C B
2SA675
2SA950
2SC388A

WARNING ⚠ INDICATES SAFETY CRITICAL COMPONENTS FOR CONTINUED SAFETY.
REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER'S
RECOMMENDED PARTS

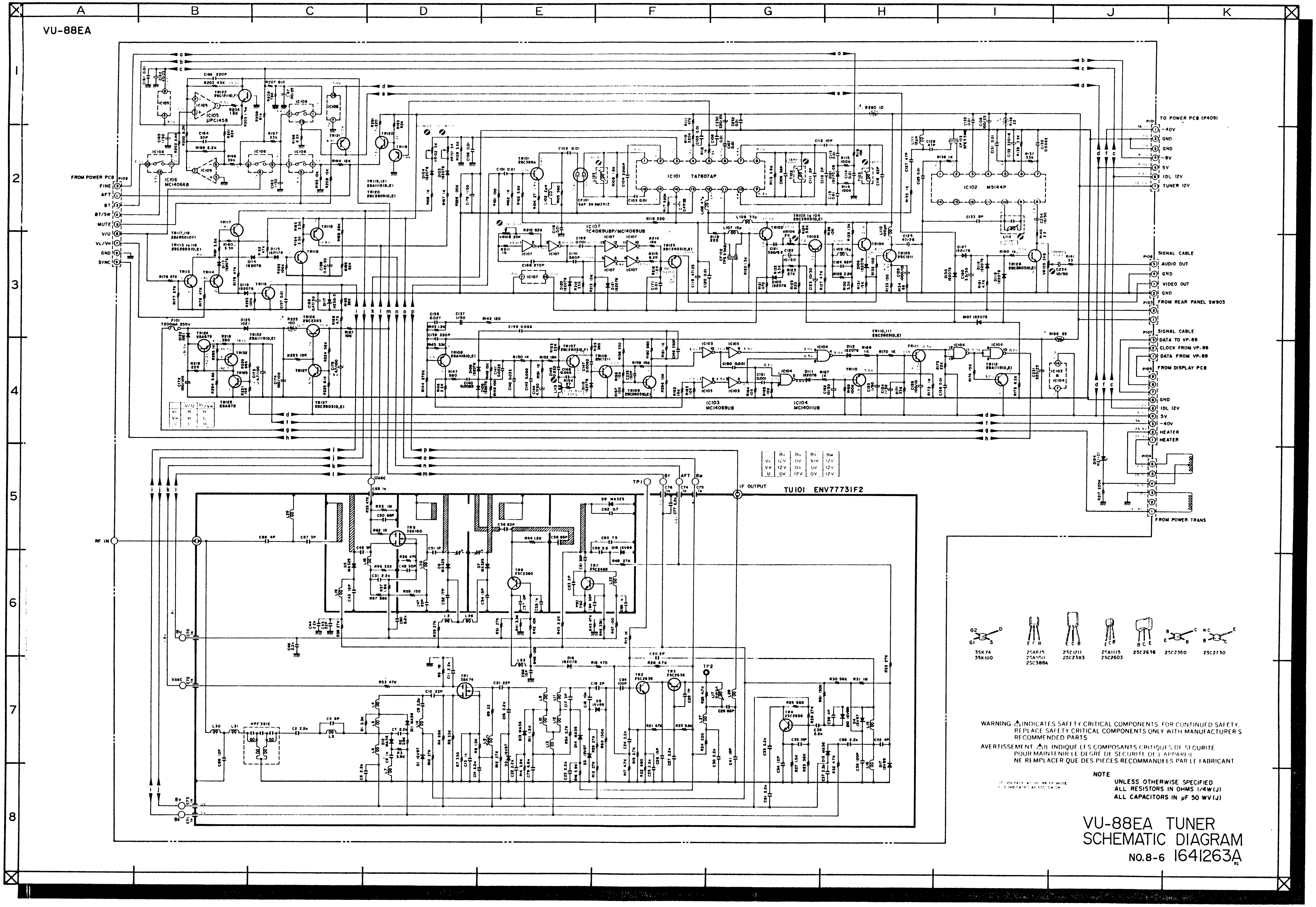
AVERTISSEMENT ⚠ IL INDIQUE LES COMPOSANTS CRITIQUES DE SECURITE.
POUR MAINTENIR LE DEGRE DE SECURITE DE L'APPAREIL,
NE REMPLACER QUE DES PIECES RECOMMANDEES PAR LE FABRICANT

NOTE
UNLESS OTHERWISE SPECIFIED
ALL RESISTORS IN OHMS 1/4W(J)
ALL CAPACITORS IN μF 50WV(J)

REFER THE DC VOLTAGE TO VU-88EG
TUNER CIRCUIT DIAGRAM

VU-88EK TUNER SCHEMATIC DIAGRAM

NO. 8-5 1641264A
2C


VU-88EA
A
B
C
D
E
F
G
H
I
J
K
1
2
3
4
5
6
7
8
FROM POWER PCB
P102
FINE
AFT
BT
BT/SW
MUTE
V/U
VL/VH
GND
SYNC
IC105 µPC1458
IC106 MC14066B
IC101 TA7607AP
IC102 M5144P
IC107 TC4069UBP/MC14069UB
IC103 MC14069UB
IC104 MC14011UB
TO POWER PCB (P409)
P101
-40V
GND
GND
-8V
5V
IDL 12V
TUNER 12V
SIGNAL CABLE
P108
AUDIO OUT
GND
VIDEO OUT
GND
P103
FROM REAR PANEL SW903
P107
SIGNAL CABLE
DATA TO VP-88
CLOCK FROM VP-88
DATA FROM VP-88
P105
FROM DISPLAY PCB
GND
IDL 12V
5V
-40V
HEATER
HEATER
P104
FROM POWER TRANS
D124 HZ11C1
R217 220K
F101 T200mA 250V
RF IN
TP1
TP2
IF OUTPUT
TU101 ENV77731F2
Bu
Vaec
Bv
Bs
HPF 3612
G2
D
G1
S
3SK74
3SK100
E C B
2SA675
2SA950
2SC388A
E C B
2SC1211
2SC2383
E C B
2SA1115
2SC2603
B C E
2SC2636
B
C
E
B
2SC2360
N.C
E
B
C
2SC2730

WARNING ⚠ INDICATES SAFETY CRITICAL COMPONENTS FOR CONTINUED SAFETY. REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER'S RECOMMENDED PARTS

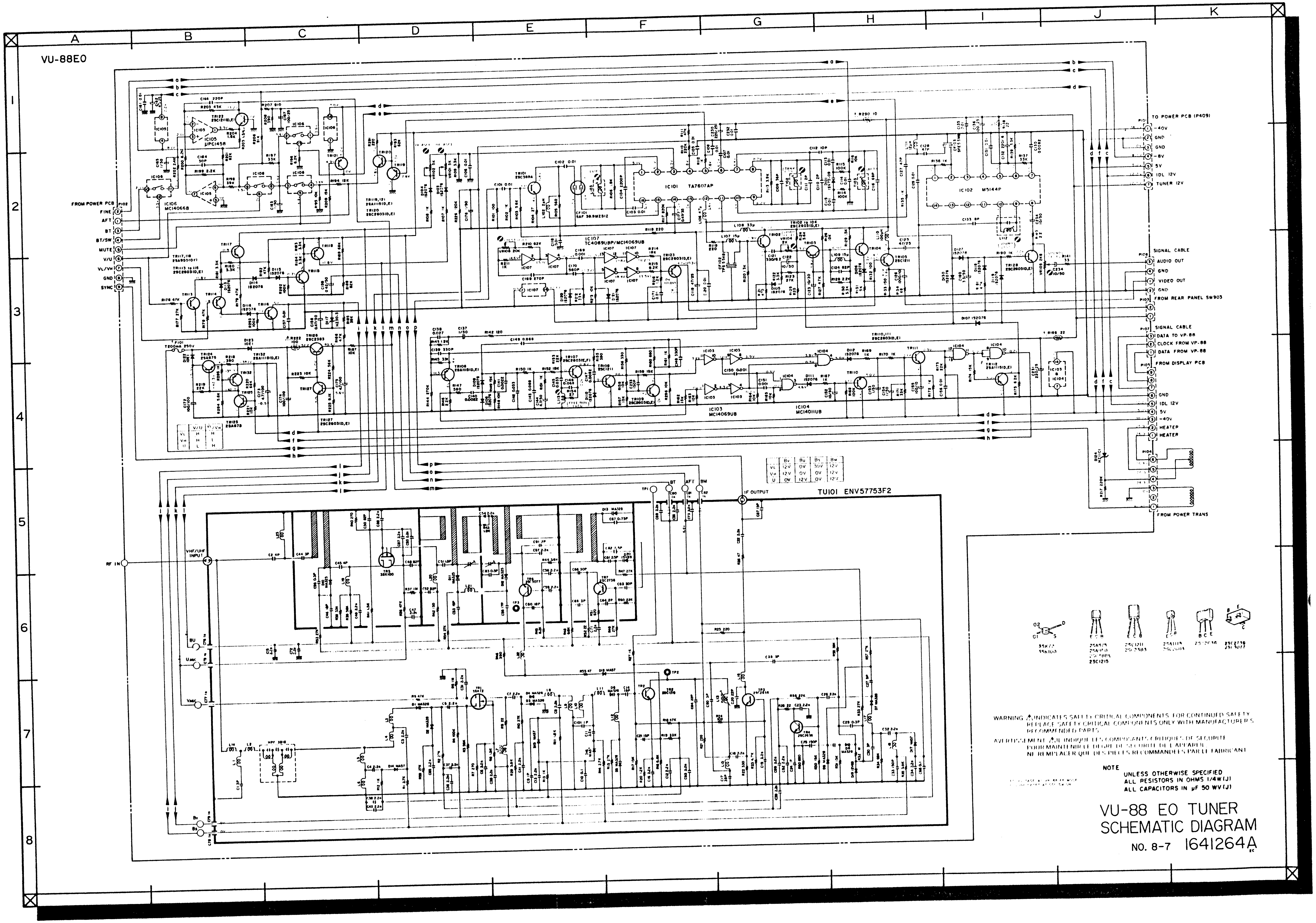
AVERTISSEMENT ⚠ IL INDIQUE LES COMPOSANTS CRITIQUES DE SECURITE POUR MAINTENIR LE DEGRE DE SECURITE DE L'APPAREIL. NE REMPLACER QUE DES PIECES RECOMMANDEES PAR LE FABRICANT

NOTE

UNLESS OTHERWISE SPECIFIED
ALL RESISTORS IN OHMS 1/4W(J)
ALL CAPACITORS IN µF 50 WV(J)

VU-88EA TUNER SCHEMATIC DIAGRAM

NO.8-6 1641263A


VU-88E0
A
B
C
D
E
F
G
H
I
J
K
1
2
3
4
5
6
7
8
FROM POWER PCB
P102
FINE
AFT
BT
BT/SW
MUTE
V/U
VL/VH
GND
SYNC
IC105 μPC1458
IC106 MC14066B
IC101 TA7607AP
IC102 M5144P
IC107 TC4069UBP/MC14069UB
IC103 MC14069UB
IC104 MC14011UB
TU101 ENV57753F2
IF OUTPUT
RF IN
VHF/UHF INPUT
TP1
BT
AFT
BM
TP2
TP3
BU
Uosc
Vosc
Bv
Bs
TO POWER PCB (P409)
P101
-40V
GND
GND
-8V
5V
IDL 12V
TUNER 12V
SIGNAL CABLE
P108
AUDIO OUT
GND
VIDEO OUT
GND
P103
FROM REAR PANEL SW903
P107
SIGNAL CABLE
DATA TO VP-88
CLOCK FROM VP-88
DATA FROM VP-88
P105
FROM DISPLAY PCB
GND
IDL 12V
5V
-40V
HEATER
HEATER
P104
FROM POWER TRANS
D124 HZ11C1
R217 220K
TR125 2SA675
3SK73
3SK100
2SA515
2SA950
2SC1008A
2SC1215
2SC1211
2SC2383
2SA1115
2SC2603
2SC2736
2SC3077

	V/U	VL/VH
VL	H	H
VH	H	L
U	L	H

	Bv	Bu	Bs	BM
VL	12V	0V	30V	12V
VH	12V	0V	0V	12V
U	0V	12V	0V	12V

WARNING ⚠ INDICATES SAFETY CRITICAL COMPONENTS FOR CONTINUED SAFETY
REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER'S
RECOMMENDED PARTS.

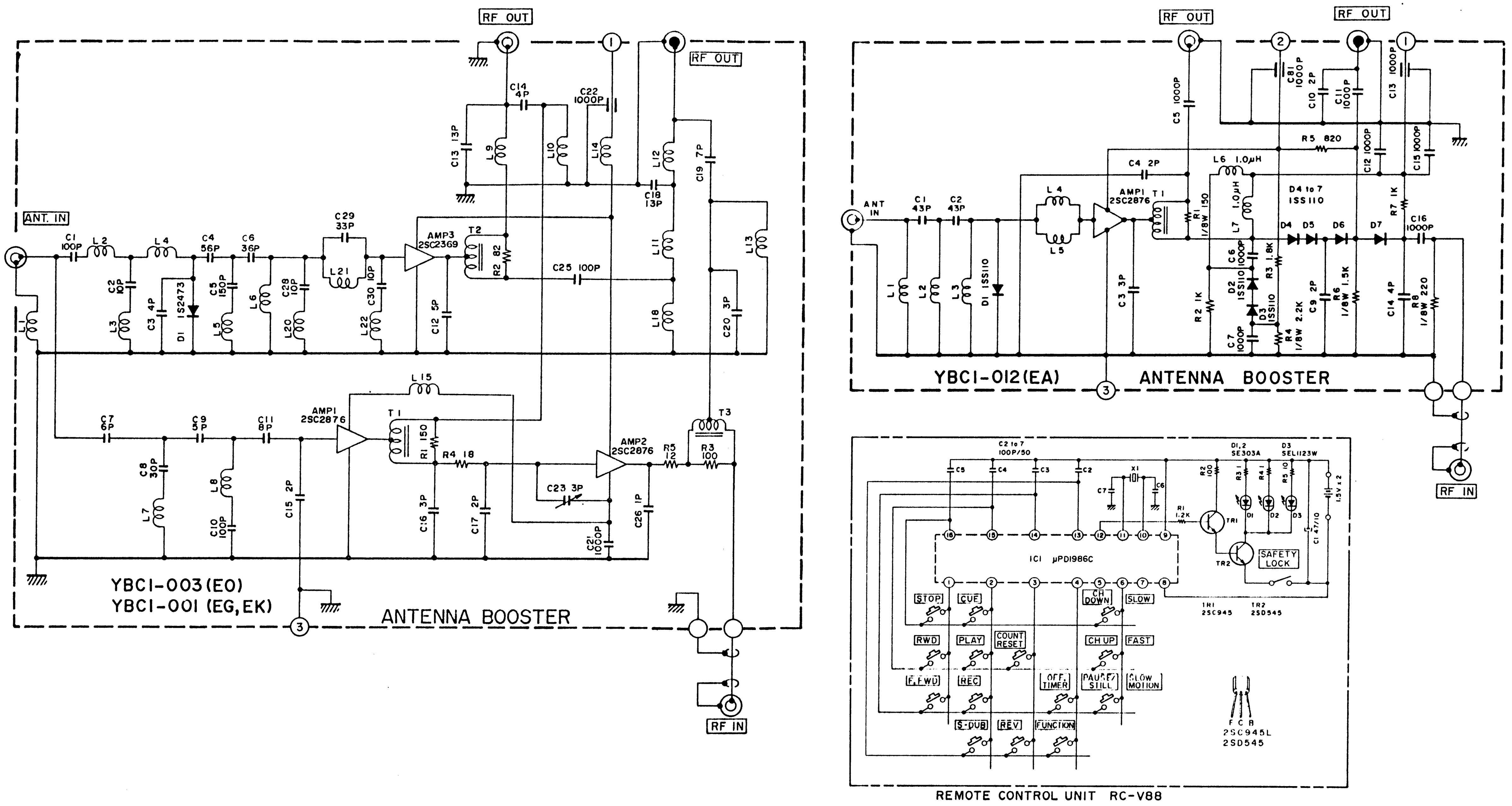
AVERTISSEMENT ⚠ LE INDIQUE LES COMPOSANTS CRITIQUES DE SECURITE
POUR MAINTENIR LE DEGRE DE SECURITE DE L'APPAREIL.
NE REMPLACER QUE DES PIECES RECOMMANDEES PAR LE FABRICANT

NOTE
UNLESS OTHERWISE SPECIFIED
ALL RESISTORS IN OHMS 1/4W(J)
ALL CAPACITORS IN μF 50 WV(J)

VU-88 EO TUNER
SCHEMATIC DIAGRAM

NO. 8-7 1641264A

VU-88EG/EK/EA/EO


RF OUT
RF OUT
ANT. IN
AMP3 2SC2369
AMP1 2SC2876
AMP2 2SC2876
T1
T2
T3
C1 100P
C4 56P
C6 36P
C29 33P
C25 100P
C14 4P
C22 1000P
C13 13P
C18 13P
C19 7P
C20 3P
C7 6P
C9 5P
C11 8P
C23 3P
C21 1000P
C26 1P
R1 150
R4 18
R5 12
R3 100
D1 1S2473
YBC1-003(EO)
YBC1-001 (EG,EK)
ANTENNA BOOSTER
RF IN
ANT IN
C1 43P
C2 43P
AMP1 2SC2876
D1 1SS110
D4 to 7 1SS110
L6 1.0μH
L7 1.0μH
R5 820
C16 1000P
YBC1-012(EA)
ANTENNA BOOSTER
RF IN
C2 to 7 100P/50
D1,2 SE303A
D3 SEL1123W
IC1 μPD1986C
TR1
TR2
SAFETY LOCK
1.5V×2
STOP
CUE
CH DOWN
SLOW
RWD
PLAY
COUNT RESET
CH UP
FAST
F.FWD
REC
OFF. TIMER
PAUSE/ STILL
SLOW MOTION
S-DUB
REV
FUNCTION
TR1 2SC945
TR2 2SD545
E C B
2SC945L
2SD545
REMOTE CONTROL UNIT RC-V88

VU-88EG/EK/EA/EO BOOSTER, RC-V88 SCHEMATIC DIAGRAM

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